



# COUNTY OF LOS ANGELES

## FIRE DEPARTMENT

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April 30, 2010

TO: EACH SUPERVISOR

FROM: P. MICHAEL FREEMAN

### WEB POSTING OF THE CAMP 16 SERIOUS ACCIDENT REVIEW FACTUAL REPORT

On April 22, 2010, we posted a memo to the County's Board Correspondence website regarding the publication of the Camp 16 Serious Accident Review Factual Report. We also delivered hard copies of the report to your offices. However, when we posted the memo to the website, the attachment was inadvertently left off.

To correct this, the Camp 16 Serious Accident Review Factual Report has now been posted to the County's Board Correspondence website for public review.

If you have any questions or need more information, please call me at (323) 881-2401.

PMF:kh

Attachment

c: William T Fujioka  
Jackie White  
Vicky Santana  
Randi Tahara  
Joseph Charney  
Rick Velasquez  
Sussy Nemer  
Sachi Hamai

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SIGNAL HILL  
SOUTH EL MONTE  
SOUTH GATE  
TEMPLE CITY  
WALNUT  
WEST HOLLYWOOD  
WESTLAKE VILLAGE  
WHITTIER

# **Factual Report**



## **Camp 16 Incident**

### **Burnover And Fatal Vehicle Accident**

**August 30, 2009**

**CA-LAC-09196997**

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## Foreword

Fire Captain Ted Hall, Superintendent 16, and Fire Fighter Specialist Arnie Quinones, Foreman Crew 16-3, are two brother firefighters we shall never forget. They will be remembered as proud, cherished family men, and courageous firefighters, steadfast in their quest for excellence, hard work and completion of the mission. Known for their passion for the job and dedication to their co-workers, they live in our memories even though they have left us.

The focus of this Camp 16 Factual Report is that fateful day of August 30, 2009, when Ted and Arnie gave their lives performing their last act of courage. While most of us were still reeling from the grief, raw emotions, and disbelief of what had happened, the Serious Accident Review Team began their work of recounting all aspects of this fatal accident.

Working through their own shock, that interagency Team interviewed every witness, and gathered facts and evidence. Experts on fire behavior, weather and wildland firefighting, along with a Multidisciplinary Accident Investigation Team from California Highway Patrol, reviewed every detail so that all that could be learned would be covered and presented in the report.

Early in the process, the Los Angeles County Sheriff's Department Homicide Bureau detectives joined the effort since the cause of the fire was arson. A somber and monumental task lay ahead, but the goal of an accurate, thorough re-creation of what led up to the accident forged the Serious Accident Review Team into an unflappable human machine working in honor of Ted and Arnie. The results of this phenomenal effort follow.

That day, there was a plan in place to defend Camp 16 and to protect those who would remain if the fire approached. The plan had been developed by Superintendent Hall and his crews during the preceding two years. During that time crews had cut back fuels 200 feet below and along Mt. Gleason Road, south of the Camp. All other fuels and duff within the camp had been removed, and trees had been cleared of growth that might serve as "ladders" for ground level fire to spread into the trees.

On Saturday, August 29, 2009, two LA County engine companies were requested to assist at the camp. The plan was briefed to all and re-emphasized during that day and Sunday as well. The fire was scouted periodically and monitored; observed fire behavior and weather conditions did not raise concerns. When California Department of Corrections and Rehabilitation (CDCR) personnel who were unfamiliar with Personal Protective Equipment and fire shelters arrived, they were trained in proper donning and use.

Based on the observed fire behavior, confidence in the plan, and leadership at Camp 16, there was a belief that if the fire approached, personnel would take shelter inside the buildings until the fire blew through the area. Based on experience, skill and what was visible, the plan and tactic of a firing operation along Mt. Gleason Road made sense.

Yet, something went horribly wrong. The fire quickly and unexpectedly pushed across the west end of the Camp and then almost instantly surrounded and burned through the entire compound. There was no time for Ted and Arnie to return to the safety of the Camp area; the plan did not contemplate this extreme fire behavior and area ignition.

Firefighters within the camp followed the plan precisely, but conditions deteriorated quickly. It became untenable outside of the vehicles or structures. Flame lengths of 200 feet or more were observed and photographed. The entire bowl of heavy fuels below the camp exploded over the



camp, igniting a crown fire that pulled the fire through the camp and into the tree plantation north of Camp 16.

Despite the firestorm and life-threatening conditions in the camp compound, cool heads, leadership, split second decision making, raw courage and sound execution of orders given saved 72 lives that day. Inmate crews and officers were quickly moved out of the dining hall just before it was engulfed in flames. The use of crew carrier vehicles, fire shelters and tactical relocation of fire engines and crew carriers made the difference. Calm, decisive and experience-based leadership led to success and life safety in a situation clearly gone bad.

In retrospect, it is clear that conditions were intensified by strong, erratic winds, most likely associated with aggressive fire progression and collapse of the pyro-cumulus plume above Camp 16. This plume, though not visible to the personnel on the ground, provides an important lesson about plume generation and its influence on wildfires. This dynamic phenomenon is not frequently seen or experienced, but one that can ruin the day. This report clearly addresses convergence of prolonged drought, high temperatures, low humidities, heavy fuels, steep topography and plume domination. Such a combination, especially in the vicinity of Camp 16 on August 30, 2009, created a perfect storm that took the lives of two gallant firefighters, destroyed the camp they planned to protect, and placed 72 other persons at great risk.

All of us are deeply indebted to the members of the Serious Accident Review Team. We thank CAL FIRE Director Del Walters for providing his staff and experience to conduct this review. Appreciation is also extended to the California Highway Patrol Commissioner Joseph Farrow, and Los Angeles County Sheriff Leroy D. Baca, whose personnel unequivocally committed their expertise and heartfelt support to us.

Special recognition is given to Los Angeles County Fire Department personnel. First, to those firefighters and officers whose split second actions and reactions during this event undoubtedly made the difference between life and death for those sheltered at Camp 16. Appreciation is also given to all those who contributed to this factual review by carefully analyzing the witness statements, conducting research, and writing this report. We also thank the CDCR correctional officers and inmates for their performance during the emergency and in furnishing their factual accounts of what they saw and experienced.

Read this report carefully. Put yourself in the same situation as the crews at Camp 16 that day. Look for lessons that will lead you and your firefighting colleagues to watch, prepare for, and ultimately avoid the perfect storm; do this in honor of Ted Hall and Arnie Quinones.

P. Michael Freeman  
Fire Chief  
Los Angeles County Fire Department  
April 2010

## ***REVIEW OF TEAM PROCESS***

On Wednesday August 26<sup>th</sup>, 2009 the Station Fire started. This large fire burned over Camp 16 on Sunday August 30<sup>th</sup>, 2009 resulting in the deaths of two Los Angeles County Fire Department firefighters, numerous minor injuries and extensive damage to Camp 16.

### ***Investigation Process Summary***

On September 1, 2009 a Serious Accident Review Team (SART) was assembled to investigate the vehicle accident and burn-over that occurred on August 30<sup>th</sup>, 2009 at Los Angeles County Fire Department Camp 16 (Mt. Gleason). The team was made up of personnel from the Los Angeles County Fire Department (LACoFD), California Department of Forestry and Fire Protection (CAL FIRE), California Department of Corrections and Rehabilitation (CDCR) and the California Highway Patrol (CHP). The team included 47 interagency members (see attached roster).

### ***Investigative Team Authority***

The team was given authority to conduct an accident review from Los Angeles County Fire Department Chief P. Michael Freeman.

The team had authority to utilize technical support personnel necessary to complete the accident review. John Ellis (SART team leader) received delegation of authority from Director Del Walters, CAL FIRE and Deputy Chief Michael Bryant, Los Angeles County Fire Department. The team was directed to do the following:

Investigate the motor vehicle accident in conjunction with the California Highway Patrol Multidisciplinary Accident Investigation Team (MAIT).

Investigate the burn over and sequence of events at Camp 16.

Complete Blue and Green summary sheets.

Identify factual data associated with the circumstances relating to the incident.

Accurately and objectively record the findings of this review.

Develop and submit a factual report to the Chief of the Los Angeles County Fire Department.

### ***Investigation Process***

The investigation process involved the use of the organizational structure of the Incident Command System (ICS) to manage team assignments, investigation protocols, briefings, witness interviews, and the collection of evidence. A collaborative interagency effort was developed with MAIT and their accident investigation to develop report findings.

Interview teams were established using a combination of CAL FIRE, MAIT, and LACoFD investigators to facilitate complete comprehensive interviews of witnesses.

Four team meetings were held to facilitate completion of this report. The meetings consisted of full team meetings and meetings with specialties such as Fire Behavior Analysts.

A Review and Recommendation working group was established consisting of LACoFD personnel to review the draft report. The working group was tasked to review current LACoFD policies and procedures and make recommendations on changes or modifications of those policies as appropriate. These recommendations were presented to the Board of Review (BOR).

## TEAM ROSTER

<b>John Ellis</b>	<b>Team Leader</b>	<b>CAL FIRE</b>
<b>Rob Van Wormer</b>	<b>Assistant Team Leader</b>	<b>CAL FIRE</b>
<b>Joel Harrison</b>	<b>Liaison/Agency Representative</b>	<b>LACoFD</b>
<b>Josh White</b>	<b>Lead Investigator</b>	<b>CAL FIRE</b>
<b>Curt Itson</b>	<b>Lead Investigator</b>	<b>CAL FIRE</b>
<b>Brian Layne</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Tom MacPherson</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Tanya Lange</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Mike Kaslin</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Paul Schifando</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Marshall Oldham</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Art Barrera</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Tony Clift</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Geno Ketelslegar</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Steve Khodavandi</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Tim Cremins</b>	<b>Investigator</b>	<b>LACoFD</b>
<b>Richard Lopez</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Paul Alvarez</b>	<b>Investigator</b>	<b>CAL FIRE</b>
<b>Darren Hensley</b>	<b>Mobile Equipment Specialist</b>	<b>CAL FIRE</b>
<b>Herb Love</b>	<b>Safety Officer</b>	<b>CAL FIRE</b>
<b>Jim Reed</b>	<b>Training Specialist</b>	<b>LACoFD</b>
<b>Jeff Young</b>	<b>Training Specialist</b>	<b>CAL FIRE</b>
<b>Will Pryor</b>	<b>Labor Representative</b>	<b>LACoFD</b>
<b>Bill Shaw</b>	<b>Procurement</b>	<b>CAL FIRE</b>
<b>Rachel Cole</b>	<b>Procurement</b>	<b>CAL FIRE</b>
<b>Misty Marschall</b>	<b>Documentation</b>	<b>CAL FIRE</b>
<b>Catey Trenner</b>	<b>GIS Technician</b>	<b>CAL FIRE</b>
<b>Bill Mock</b>	<b>CDCR Agency Representative</b>	<b>CDCR</b>
<b>Bill Baxter</b>	<b>Fire Behavior Analyst</b>	<b>CAL FIRE</b>
<b>Eric Kurtz</b>	<b>Fire Behavior Analyst(T)</b>	<b>CAL FIRE</b>
<b>Jeff Gawronski</b>	<b>Survey Lead</b>	<b>CAL FIRE</b>
<b>Dan Gregory</b>	<b>Surveyor</b>	<b>CAL FIRE</b>
<b>David Koroly</b>	<b>Surveyor</b>	<b>CAL FIRE</b>
<b>Don Karol</b>	<b>MAIT Leader</b>	<b>CHP</b>
<b>John Grindey</b>	<b>MAIT</b>	<b>CHP</b>
<b>John Isbister</b>	<b>MAIT</b>	<b>CHP</b>
<b>Paul Grey</b>	<b>MAIT</b>	<b>CHP</b>
<b>Christopher Buono</b>	<b>MAIT</b>	<b>CHP</b>
<b>Warren Tham</b>	<b>MAIT</b>	<b>Caltrans</b>
<b>Gary Adkins</b>	<b>MAIT</b>	<b>CHP</b>
<b>Jean Paz</b>	<b>MAIT</b>	<b>CHP</b>
<b>Frank Uyemori</b>	<b>MAIT</b>	<b>CHP</b>

## *Overview of Accident*

On Sunday, August 30<sup>th</sup>, 2009 the Station Fire approached Los Angeles County Fire Department Mt. Gleason Fire Camp 16 (Camp 16). The fast approaching fire impacted Camp 16 at approximately 1645 hrs. and continued to burn throughout Camp 16 until approximately 1830 hrs. with high intensity. During this time a vehicle accident, shelter deployments and the sheltering of personnel in structures and vehicles occurred.

The burn-over contributed to two Los Angeles County Fire Department(LACoFD) personnel receiving fatal injuries in a vehicle accident and 13 personnel from LACoFD received other injuries such as stress, smoke inhalation and eye irritation. The injured personnel were treated at local medical facilities and released. The California Department of Corrections and Rehabilitation (CDCR) personnel and inmates were transported to a local institution for medical evaluation and were returned to duty.

Camp 16 is located on Mt. Gleason Road approximately 6 miles west of the Angeles Forest Highway. Camp 16 is located within the boundaries of the Angeles National Forest approximately 7 miles south of the community of Acton, California. The fatal accident site was located approximately 800 feet below Mt. Gleason Road south of the camp.

The camp kitchen/dining hall was identified during planning sessions as the building to be used for sheltering of personnel. As the flame front approached the camp, the order was given to have the camp crews and CDCR personnel report to the kitchen/dining hall refuge area. The engine company personnel reported to their preplanned areas for structure protection assignments.

A planned firing operation was initiated on a mid-slope road just below Camp 16 and running parallel to the ridge. The firing operation was started below the helipad and continued to the southeast. The fire began impacting the camp on the north end. Communication with the firing team was lost when the fire began impacting the southern end of the Camp; approximately 11 minutes after the fire impacted the north end of the camp.

It became apparent to the fire personnel inside the kitchen/dining hall that the building had become involved with fire. The command was given to prepare their fire shelters for deployment in anticipation of exiting the structure and deploying in the shelters on the roadway.

As the fire crested the ridge near the south end of the camp, flame lengths were in excess of 200 feet. Structure protection around the camp was abandoned and the inmates were ordered to move to crew carrying vehicles. Shelters were deployed and used to protect the personnel from the radiant heat as they progressed from the kitchen/dining room to the vehicles.

All vehicles were moved to the north end of the camp where the fire had already burned through. All personnel sheltered in the vehicles and personnel accountability reports were given to the Battalion Chief. When no response was received from the firing team the Battalion Chief ordered a search of the area for the two missing personnel.

The firing team and their vehicle were discovered approximately 800 feet off the road in the ravine to the south of the camp. Both personnel assigned to the firing operation were found deceased.

Personnel from Camp 16 were transported to medical facilities for examination. By 0430 hours on August 31, 2009, the bodies of the deceased firefighters were removed.

See Attachments 7, 8, 9 and 10 for maps, photographs and diagrams designed to provide the readers of this report with a visual overview of the camp and the surrounding area.

## ***SEQUENCE OF EVENTS***

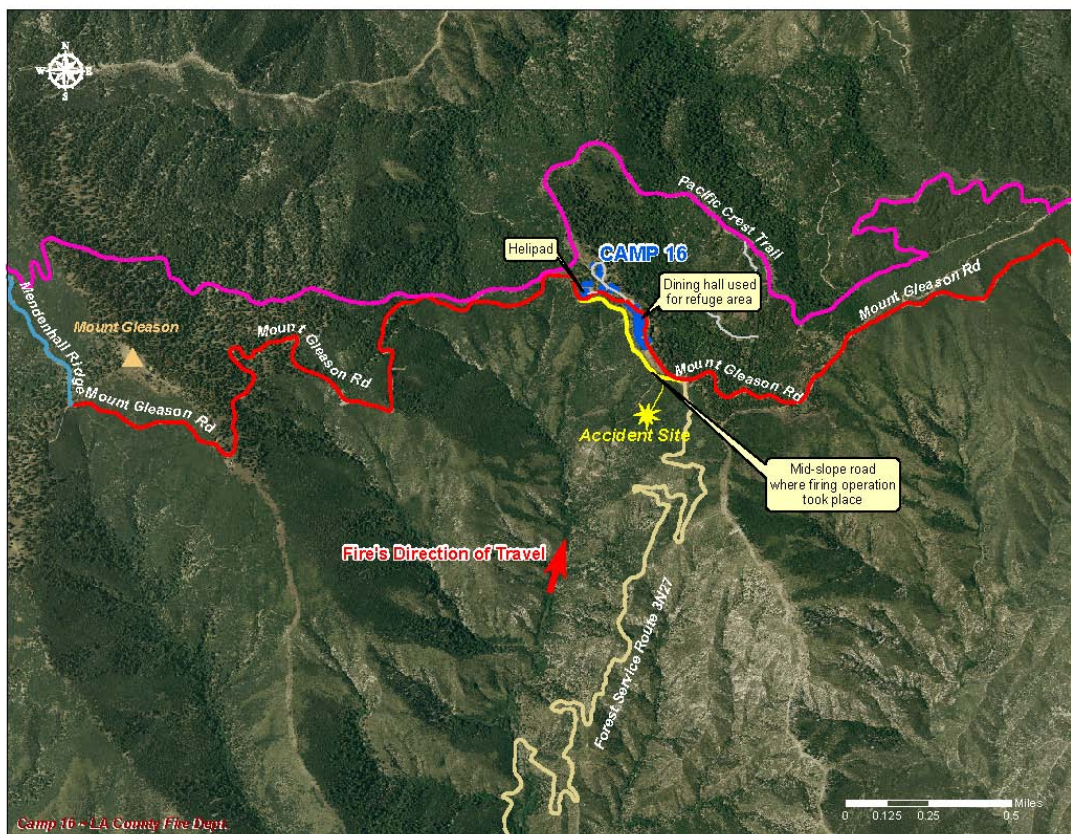
On the afternoon of Wednesday, August 26, 2009, at approximately 1520 hours the Angeles Crest Ranger Station for the United States Forest Service (USFS) Angeles National Forest (ANF) received a walk-in report of a vegetation fire burning on the Angeles Crest Highway near mile marker 29 (approximately 1 ½ miles from the station). The ANF dispatched a vegetation fire response. At 1522 hours the Los Angeles County Fire Department (LACoFD) received a 911 telephone report of the fire and initiated a standard brush fire response.

The fire, named the “Station Fire”, progressed to the northeast from the Angeles Crest Highway. The initial size-up from the ANF equipment at 1531 hours was “Three acres and running”. ANF was in command of the fire. By 1536 hours the fire was reported to be ten acres burning in heavy brush with a rapid rate of spread. At 1845 hours LACoFD Battalion Chief 6 (BC6) reported 25-30 acres, at the ridgeline with minimal active flame. At 1929 hours LACoFD aircraft and three engines were released from the fire. At 1340 hours on Thursday, August 27 Unified Command with ANF was established due to fire growth.

The Station Fire continued to progress in a northeast direction over the next three days. The fire was predominately a fuel/topography driven event, under a plume dominated environment with record high temperatures, low humidity, and extremely dry fuels. Many areas impacted by the fire had no recorded fire history and contained decadent old growth fuels.

LACoFD Camp 16 houses 105 inmate firefighters, and is one of five fire camps in a cooperative program between the LACoFD and the California Department of Corrections and Rehabilitation (CDCR). The camp provides six fire crews, with staffing of one LACoFD Fire Captain assigned as a Camp Superintendent (Supt.), ten Fire Fighter Specialists assigned as Camp Foremen (Foreman), one CDCR Lieutenant, one Sergeant and seven Correctional Officers.

Camp 16 opened in 1979 and is located in the ANF. The buildings and land are under a long-term lease from the USFS. The Camp is located on a mountain ridge at the 5600 foot elevation, Camp 16 was originally built as a Nike missile base under the Army’s command, and was operational from 1956 to 1974. The mountain ridge runs slightly northwest to southeast between the North Fork of Mill Creek and the Gleason Canyon drainages. Mount Gleason is located 1.6 miles due west of Camp 16. Access to the camp is from Angeles Forest Highway to Mt. Gleason Road. Camp 16 is six miles up Mt. Gleason Road along a narrow two lane winding paved road .



*Satellite image shows the general camp area, specific locations within the camp, main roads and trails, fuels and the general direction of fire travel that will help the reader better understand the incident.*

On Saturday August 29, Crew 16-6 which includes 14 inmates was determined by CDCR Officers (Witness 11) and (Witness 12) to be non-essential to protect Camp 16. This crew was assigned to Camp 14 in Francisquito Canyon. Crews 16-3 and 16-4 were out of the area on an unrelated fire. The Camp inmate population included three Fire Crews and three kitchen workers. The LACoFD staff remaining at Camp 16 consisted of Supt. Tedmund Hall and Foremen Arnaldo Quinones (Crew 16-2), Witness 21 (Crew 16-1), and Witness 22 (Crew 16-5). The CDCR staff was Witness 11 and Witness 12.

Supt. Hall (Supt. 16), Camp Foremen and CDCR staff met on the morning of the 29<sup>th</sup> in the LACoFD Bachelor Officer's Quarters (BOQ) and discussed a plan to protect the camp from the approaching Station Fire. Work assignments were made, and a discussion of strategy and tactics to protect the camp occurred. Several trigger points were established that would initiate specific actions within the camp.





*Close up image identifies structures and locations within the camp.*

The staff and inmates worked throughout the day opening scuttles for attic access, moving wood piles away from structures, setting up lights, preparing the generators and clearing vegetation from around buildings. The area around the camp was scouted several times throughout the day to determine fire progress and weather conditions. Water sources were ensured and several portable water storage units (water buffalos) were placed throughout the camp.

Between 1200 and 1300 hours, Supt. Hall assigned Witness 22 to scout the fire at Messenger Flats, Lightning Point and Condor Peak. During the scouting, Witness 22 observed the fire cresting Condor Peak around Mendenhall Motorway. Witness 22 determined that the fire location was approximately eight miles away and in alignment with Camp 16 based on the burning direction.

Supt. Hall was in contact with LACoFD Battalion Chief (Witness 25) on Saturday. Supt. Hall had discussed his firing operation with Witness 25 and identified one of the trigger points to begin firing operations as the bottom of the drainage below Camp 16. Supt. Hall also requested two additional fire engines to assist with protecting Camp 16. At 1500 hours Witness 25 called LA County Fire Command and Control Battalion Chief (Witness 62) at Los Angeles Communications Center (LACC) and requested two engines for structure protection at the camp. Witness 62 called Witness 25 at 1504 hours and advised that LACoFD Engine 80 (E80) and LACoFD Engine 131 (E131) would be assigned. At 1531 hours E131 arrived at Camp 16 and E80 arrived at 1549 hours.

Foreman (Witness 20), who was off duty, came to the camp at approximately 1800 hours on Saturday August 29. Witness 20 arrived at the camp to assist and met with Foreman Quinones. Quinones drove Witness 20 around the camp explaining what prep work was completed and briefed him on the plan to protect the camp.

At approximately 1900 hours, CDCR Facility Captain (Witness 10) arrived to assist with supporting the camp inmate operations. The CDCR Camp Commander for Camp 16 was on assignment out of the area.

At approximately 2200 hours Foremen Quinones and Witness 20 met with Supt. Hall at the front gate, south end, of Camp 16. Supt. Hall had been patrolling the area and watching the fire. Witness 20 joined Supt. Hall and they drove together to Lightning Point, west of Camp 16. Supt. Hall and Witness 20 watched the fire to the west and northwest of Lightning Point. They continued to Messenger Flats, then returned to camp. At approximately 0000 hours Supt. Hall and Witness 20 drove out to Lightning Point to monitor the fire's progress. Supt. Hall and Witness 20 estimated the fire to be eight miles away at Strawberry Flats.

Supt. Hall directed Witness 20 to monitor the fire's progress by waking every two hours and making observations. At approximately 0300 and 0500 hours Witness 20 woke and checked the fire, with nothing to report.

On Sunday, August 30, 2009 the Station Fire Incident Management Team (IMT) designated the north edge of this growing fire as Branch IV. After the original printing of the Incident Action Plan (IAP), USFS employee (Witness 129), a Fire Management Officer (FMO) from the Santa Fe National Forest, was assigned as Branch IV Director. Witness 129 was assigned three divisions within Branch IV. These divisions were identified as Division H, L and M and assigned resources. Division M was not assigned a supervisor due to a lack of overhead resources. El Dorado County Fire Department Battalion Chief (Witness 65), assigned as a strike team leader on the Station Fire offered to maintain accountability and communications for the resources assigned to Division M. Witness 65 cautioned Witness 129 that he could not assume full Division Supervisor responsibilities due to his commitment to the strike team. Neither Witness 129 nor Witness 65 were from the local area and they were initially unaware of Camp 16's location.

At approximately 0900 hours on August 30, Witness 20 and Witness 10 left for Camp 14 to bring Crew 16-6 back to the camp. At Camp 16, Witness 22 provided shelter deployment instruction to the three non-fire trained inmates. Witness 22 also outfitted each inmate with a full set of wildland personal protective equipment (PPE).

All remaining camp personnel continued to prepare the camp for the impending fire. At approximately 1100 hours Witness 20 returned to the camp with Crew 16-6; camp population was then 55 inmates. At 1311 hours, Witness 20 and Quinones were watching the approaching fire from the helipad located at the southwest corner of Camp

16. They observed the fire as it crested Lightning Point, approximately 2 miles southwest of Camp 16 and burning in a north-northwest direction.

At approximately 1100 hours, a helicopter, Firewatch 509, was in the area of Mt. Gleason on a reconnaissance and mapping mission when the Air Tactical Group Supervisor (ATGS) noticed the camp and personnel moving about the camp. Through the smoke, the ATGS identified the camp by the identifier painted on the helipad. The ATGS recognized the fire was a direct threat to the camp. He attempted to make contact with the personnel at the camp using several different tactical frequencies. Unable to make contact with the camp, he radioed to the ANF Dispatch on the National Flight Following Frequency to report his information. His intent was for the information to be recorded and relayed by the dispatch center to the Incident Management Team in charge of the fire so appropriate notifications could be made at the camp.

At approximately 1300 hours, Witness 65 and his STL trainee drove up Gleason Canyon Road from Angeles Forest Highway. Witness 65 arrived at the entrance to Camp 16 at approximately 1330 hours and observed staff and crews working around the camp. What he saw appeared to be normal camp operations. Witness 65 did not make contact with anyone at Camp 16 and left to Aliso Canyon Road and Montgomery Ranch Road where he deployed resources for the approaching fire.

At the same time Witness 65 was arriving at Camp 16, Supt. Hall called for an additional briefing in the LACoFD BOQ. The company officers from E131, E80, CDCR Officers and the camp Foremen were present. Supt. Hall directed that prior to the fire impinging upon the camp, the inmate firefighters were to be sheltered in place in the camp dining hall. Supt. Hall assigned E80 to protect the in-camp workers' dorm and CDCR office. E131 was assigned to protect the dining hall and kitchen facilities. Supt. Hall also divided the camp into four sections; assigning Witness 20 to the northwest quarter of the camp from the mill to the CDCR BOQ, Witness 22 to the area from the CDCR BOQ to the LACoFD BOQ, Foreman Quinones to the area from the LACoFD BOQ to the end of the inmate dorms, and Witness 21 was assigned to the in-camp inmates dorm.

Just after the briefing, at approximately 1400 hours, Patrol 80 (P80) staffed with Fire Captain (Witness 19) and Firefighter (Witness 28), arrived at the camp while on patrol. Fire Captain (Witness 6) asked Battalion Chief (Witness 1) via radio if they could retain P80 to assist at Camp 16, which he approved. P80 met with engine company personnel and drove around Camp 16 for area familiarization. At approximately 1500 hours, Witness 20 asked P80 to pre-treat the area around the warehouse at the helipad. After applying foam, Witness 19 stayed at the helipad while Witness 28 went to fill P80 with water. When Witness 28 was filling P80 with the second tank of water, Witness 19 went to the helipad with Witness 20. They could not see down the canyon but estimated the fire was approximately three miles to the south in Aliso Canyon and burning laterally from the west.

At approximately 1530 hours, Witness 1 met with Supt. Hall approximately one mile to the west of Camp 16. Witness 1 and Supt. Hall had a general discussion regarding the plan while observing the fire. Supt. Hall explained to Witness 1 the Camp was divided into four sections with a Foreman assigned to each section to serve as a lookout and described the assignments for the engines. Supt. Hall explained there was going to be a firing operation on the road below the camp and the remainder of the staff and inmates would be sheltered in the dining hall. Supt. Hall explained to Witness 1 they would let the fire burn through the camp and then take action to extinguish any hotspots. They then returned to the camp. Witness 1 returned to Camp 16 and verified the engines and patrol were in their assigned locations.



*E80 in place in front of the in-camp worker's dorm and CDCR office.*

At 1540 hours, Foremen Quinones and Witness 20, Witness 11 and Witness 12 were at the helipad watching the fire conditions. Prior to 1600 hours the CDCR officers left the helipad to begin an early dinner feeding for inmates and staff. At 1600 hours Foremen Quinones and Witness 20 drove northwest from Camp 16 on Silo Road to observe the fire's progress. Witness 20 observed winds changing and fire burning on the north side of Gleason Canyon. By 1610 hours, E131 and E80 were at their assigned locations for structure protection. At 1613 hours the fire was observed on the east side of "Ice Patch", a local designation on Mt. Gleason Road, approximately one mile west of Camp 16. Foremen Quinones and Witness 20 returned to the camp and met with Supt. Hall at the access road to the helipad.



At 1625 hours Supt. Hall instructed Foreman Quinones to assist him with a firing operation on the access road below Camp 16. Foreman Quinones climbed into the back of the Supt. 16 vehicle and they drove down the helipad access road.

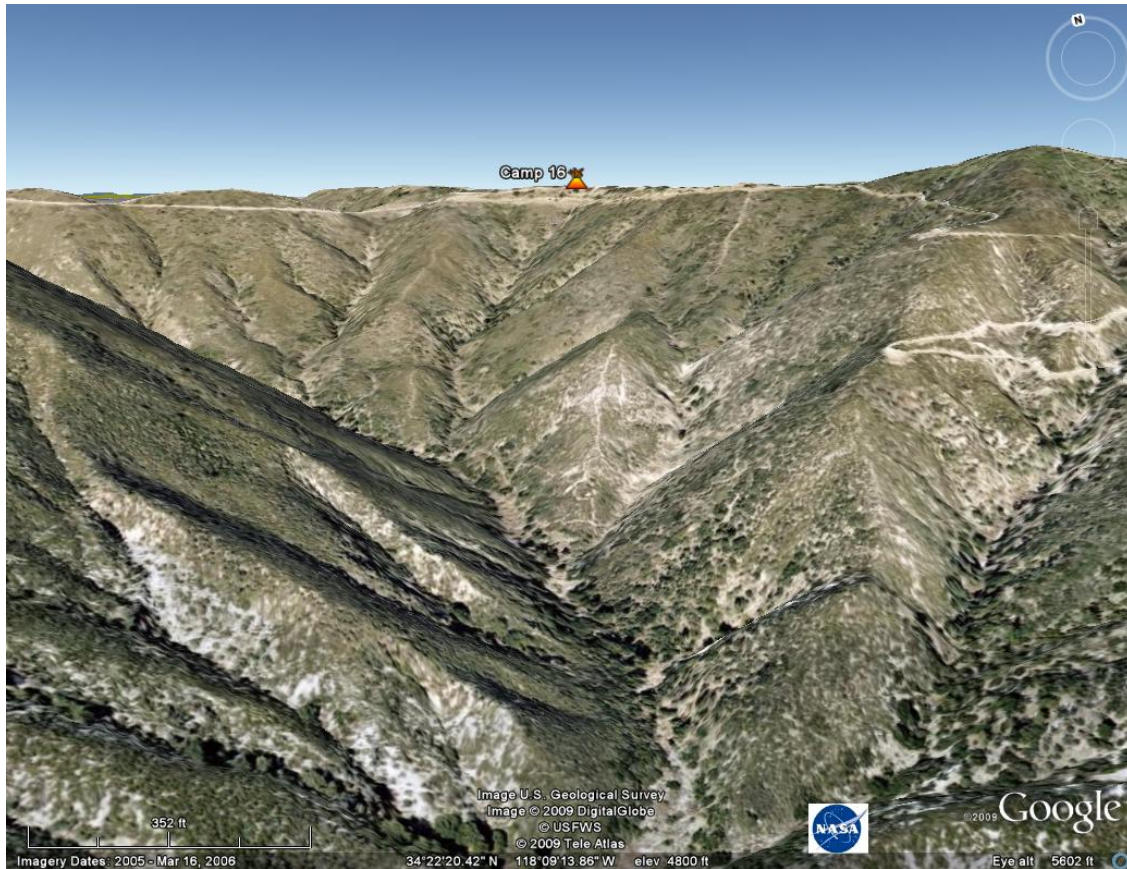


*Supt. 16 vehicle below the helipad while FFS Quinones, behind the vehicle, prepares for a firing operation.*

Several minutes later Witness 19, still in position at the helipad, watched Supt. Hall drive west of the helipad and turn around. He parked the vehicle below the helipad facing east. Foreman Quinones was seen preparing a drip torch for the firing operation and Supt. Hall was seen launching three or four rounds from a Very pistol. Witness 19 advised Supt. Hall on the radio “You got fire behind you, you got fire below you” and “You got to get out”. Witness 19 repeated his radio message and observed Supt. Hall get in the vehicle, driving further to the east but still below the helipad.

Foreman Quinones was on foot behind the vehicle, lighting fire with the drip torch. Witness 19 repeated his warning to Supt. Hall again, this time by yelling at him directly and blowing a whistle--trying to warn of the fire’s progress. Witness 19 saw Supt. Hall get out of the vehicle, then recalls seeing both Supt. Hall and Foreman Quinones moving to the vehicle as if preparing to leave the area. Witness 28 in P80 was returning from filling his tank; Witness 19 entered P80 and instructed Witness 28 to drive back into camp; conditions were rapidly deteriorating. Witness 19 felt that Supt. Hall had heard his warnings. As P80 drove out of the area, Witness 19 saw flames approximately 50 to 75 feet in length coming from the north of the helipad. Witness 19 estimated the time from his first warning to Supt. Hall to the time he left in P80 as four to five minutes.

At 1630 hours Witness 22, acting as a self appointed lookout, gave a radio report that the fire was impacting the north end of the camp. He continued to give fire updates throughout the initial fire impact.



*Image showing the North Fork of Mill Creek south of Camp 16. Mount Gleason Road is visible to the left of the camp and Edison Road is on the right descending into the drainage.*

At 1631 hours all of the camp crews were sent to the dining hall and the Camp Foremen were in their assigned locations with the exception of Foreman Quinones, who was assigned to the firing operation with Supt. Hall. At 1634 hours Witness 20 shut off power to the camp by turning off the generator. He began extinguishing spot fires. Witness 1 and P80 were patrolling the camp compound during this time. At 1638 hours Witness 22 reported on the radio that winds had increased to an estimated 50 miles per hour. At 1641 hours he reported the fire was impacting the south end of the camp. At 1642 hours Witness 22 reported flames over the top of the camp.

By 1648 hours Engine 80 had to abandon their structure protection assignment on the south side of the camp. E80 was at the far west end of the camp protecting the exterior

of the in-camp barracks. After the main fire impacted the camp, E80's crew was forced to retreat into the barracks they were protecting. Witness 6, Firefighter (Witness 7), and Firefighter (Witness 9) from E80 entered into the barracks. Witness 6 observed that all of the rooms were involved in flames.



*Photograph taken from the front of the camp, looking over the top of the in-camp worker's dorm as the fire first impacted the south end of the camp.*

During this time, Firefighter Specialist (Witness 8) from E80 was forced to seek refuge inside E80. Witness 8 observed flame lengths approximately 300 feet above the buildings and the entire area being consumed by fire in a "total area ignition" After several minutes the crew from E80 had to leave the building since it was well involved in fire and retreat to the cab of E80. After the crew of E80 was assembled, E80 began to drive toward the dining hall and E131. During this time both E131 and E80 were being directed by Witness 1 who was driving the length of the camp checking on the status of personnel and equipment.

E131 personnel were facing great difficulty in their efforts to protect the dining hall and kitchen facilities from fire. They observed the area was completely consumed by fire and the only air accessible to them to continue to work was in the dining hall. The E131 crew was breathing inside the building, then returning outside to try and keep the building from catching fire. After several more minutes, the E131 crew had to retreat to the dining area with the rest of the crews.

At 1643 hours a transmission on the radio from Supt. Hall was heard, instructing "... keep the road clear. Oh shit, oh shi..." This was the final transmission heard from Supt. Hall or Quinones.

At 1644 hours there were multiple spot fires burning throughout the compound and Witness 1 announced on the radio, "Guys, get safe, get safe" and advised E80 to leave their location if needed. A radio transmission was made seconds later advising the dorm roof was completely engulfed and 200 foot flame lengths were observed. The crews that were sheltered in the dining hall were directed to get their fire shelters out and get them ready. Witness 22 left the dining hall to move crew carrying vehicle (CCV) 16-5 closer to provide a safer environment for his crew members when they evacuated the dining hall. Several minutes later, Fire Captain (Witness 2) instructed the inmates and personnel to evacuate the dining room and Witness 1 directed personnel to the CCVs. Visibility in the area was reported to be less than five feet. Once everyone was loaded into CCVs, the vehicles were moved to the north, across from the CDCR BOQ where there was less fire intensity and smoke. One inmate had become separated from the group as they exited the dining hall and he joined the crew on E80. At 1706 hours Witness 1 requested a personnel accountability report (PAR) from everyone and no response was heard from Supt. Hall. Witness 1 then directed personnel to begin a search for Supt. Hall and Foreman Quinones.

Witness 22 drove Crew 16-5 in the CCV to the front entrance of Camp 16 in an attempt to locate Supt. Hall and Foreman Quinones. Witness 20 hiked from the upper compound to the lower access road. Witness 11 was assigned to Crew 16-2, Witness 12 and Witness 10 were assigned to Crew 16-6. Witness 21, after ensuring all of the crews were safe, drove Crew 16-1 in the CCV to look for Supt. Hall and Foreman Quinones.

Witness 20 was hiking east on Mt. Gleason Road below the camp when the heat prevented him from walking any further. Witness 22 in the CCV drove west on Mt. Gleason road, past Witness 20, turned around and picked up Witness 20 as they continued eastbound. As the CCV drove eastbound, the swamper, Inmate (Witness 114), riding in the cab with Witness 22, observed tire tracks in the berm on the shoulder of the access road. Witness 22, Witness 20 and Witness 114 exited the CCV and attempted to locate the vehicle over the edge. Seeing no vehicle, Witness 22 decided to drive further up the road for a better vantage. Prior to entering the cab of the CCV, Witness 114 found a Ford emblem piece in the road. The emblem was later determined to be from the front of Supt. 16's vehicle and had been damaged by heat. Witness 114 handed the emblem to Witness 20 before leaving.

Witness 20 continued to look for any tracks going down the hill. At 1707 hours Witness 1 contacted the Command and Control Battalion Chief (CCBC) and reported Supt. Hall and Foreman Quinones missing. At 1715 hours Witness 25 called the CCBC and requested the last known location of Supt. Hall's vehicle using the Automatic Vehicle Locating (AVL) system. The CCBC reported the last known location for Supt. Hall's vehicle was near the helipad. Witness 1 reported that AVL location over the radio. Witness 20 then began hiking westbound on the road to the helipad.



From the west, E131 approached the location where the tracks were observed over the edge. Witness 2 observed the tracks on the outside edge of the road and tracks traveling downhill through the brush. Witness 2 exited the vehicle and made his way down the embankment. Approximately 800 feet below the roadway, he found Supt. Hall's vehicle on its roof. The roof was crushed to the door frame. Witness 2 saw a body lying next to the vehicle. Witness 2 could not identify the body. Witness 2 radioed E131 confirming he had found the vehicle and there were no survivors. It was very difficult to extend a hoseline or for personnel to be on the slope due to the severe heat. A hoseline was extended down. The vehicle, body and surrounding area were extinguished. The second body was discovered inside the cab of the vehicle.



*Photograph of Camp 16 after the burn-over with accident site in lower left corner.*

Upon notification from Witness 2, Witness 1 immediately requested a helicopter, Urban Search and Rescue (USAR), a squad and an ambulance. Helicopters were unable to access the area due to smoke and blowing debris. A task force was dispatched to form at Station 80. The task force consisted of Heavy Squad 111, E81, USAR 130, P81, Glendale Rescue Ambulance 21, Montrose Search and Rescue units and Los Angeles County Sheriff's deputies. By 2000 hours the task force arrived at Camp 16 and the decision was made to utilize the steel cable on the Montrose Search and Rescue Unit to raise and lower equipment over the edge.

Witness 20 and Witness 21 returned their crews to custody of CDCR staff. A medical triage area was set up and personnel from E131, E80, P80 and Witness 21, Witness 20, and Witness 22 were examined and transported to area hospitals. All personnel were treated and released with minor injuries

ranging from smoke inhalation to eye irritation being reported.

At 2345 hours the Los Angeles Deputy Coroner arrived at the scene and made a descent down the hill to the accident site. By 0030 hours August 31, all Camp 16 inmates involved in the burnover were transported to Chino State Prison for medical evaluation and then taken to Camp 14, in Francisquito Canyon.

At 0303 hours the first body was brought up to the road, draped in an American flag and loaded into a CCV. At 0416 hours the second body was brought up to the road, draped in an American flag and loaded into a second CCV. Both bodies were then transported to the Los Angeles County morgue. At 0533 hours all personnel and equipment were brought back to the road. All resources were released from the scene by 0600 hours. Witness 65 and Witness 129 were unaware of the incident during this operational period and learned of the burnover after their return to Incident Base Camp. Camp 16 was heavily damaged by the burnover with the majority of the camp's structures being destroyed.

Investigators from the USFS, the Los Angeles Sheriff's Department and the Los Angeles County Arson Unit later determined the fire to be caused by arson. The Station Fire burned 1174 acres in the first burning cycle, 57,160 acres on August 30, 2009 alone (for a total of 94,137 to that date) and a final total of 160,557 acres before being declared fully contained on October 16, 2009 at 1900 hours. The Station Fire was the largest vegetation fire in Los Angeles County history and the 10<sup>th</sup> largest vegetation fire in California history.

## ***Findings***

A finding is a statement of a conclusion drawn from factual data established by the review. Each finding must be supported by information found elsewhere in the report. All findings are based on, and supported by, fact.

The Team utilized the 10 Standard Firefighting Orders, the 18 Situations That Shout Watch Out and LCES as the foundation for developing findings. However, there are findings that have been identified that have no basis in the above mentioned wildland fire standards.

The Team separated the findings into the following major categories; Communications ( internal to the camp and external to the Station fire), Management/Command and Control, Environmental, Materials and Equipment, Human Factors, Fuels, Topography, Urban Interface, Weather and Motor Vehicles to provide the format for the reader.

### **Communications**

#### External:

1. No communication between the Command and General Staff of the Station Fire and personnel assigned to Camp 16. (*DIN-83, W-129, W-65*)
2. The ordering process for E80 and E131 went through the on-duty LACoFD Command and Control Battalion Chief. The resources were assigned a request and order number but did not appear on the original or corrected IAP.( *DIN-83, EIN-13, DIN-93, DIN-94*)
3. Patrol 80 was never assigned an order or request number. (*DIN-93, DIN-94*)
4. The status of Camp 16 and resources assigned was never provided to the Unified IC and Structure Branch of the Station Fire. (*W-25, W-37*)
5. Regular communications were established between Battalion Chief (Witness 26) and SUPT 16 prior to the burn-over incident. (*W-26*)
6. Personnel from Camp 16 did not attend Station Fire briefings. (*W-11, W-28*)
7. Fire Watch 509 was not able to make direct contact with personnel at Camp 16 to provide emergency fire situation information. (*W-43*)
8. No contact by Witness 65 when he arrived at Camp 16 in the afternoon of August 30, 2009. (*W-65*)
9. Witness 65 did not recognize Camp 16 as an asset at risk and did not report the discovery of the occupied camp to his line supervisor.( *W-65*)

**Internal:**

10. Tactical communications at Camp 16 were on two different frequencies on two different bands. Not all personnel were monitoring both frequencies. (W-2, W-3, W-6, W-8, W-19, W-20, W-21, W-28, W-28)
11. Supt. 16 provided a face-to-face briefing with personnel assigned to Camp 16 on August 30, 2009 at 13:00 hours. (W-2, W-3, W-6, W-8, W-19, W-20, W-21, W-28, W-28)
12. Supt. 16 met face-to-face with W-1 on August 30, 2009 at approximately 15:00 hours. (W-1, W-28)
13. Patrol 80 was briefed by Engine 131 upon their arrival to Camp 16. (W-2, W-19, W-28)
14. The well established working relationship between personnel from LACoFD and CDCR prior to the burn-over, led to the rapid implementation of the plan to protect Camp 16. (W-2, W-3, W-11, W-12, W-20)
15. W-1 required continuous personnel accountability reports during and after the turnover. (W-1, W-2, W-3, W-6, W-8, W-19, W-20, W-21, W-28)
16. No lookouts were assigned to the firing operation, however multiple reports were given over the air by W-22. (W-11, W-19, W-20, W-22, EIN-10.15)

**Management Command and Control**

17. E80 had preplanned for their assignment by placing SCBAs and other equipment inside the structure. (W-6, W-7, W-8, W-9)
18. There was not adequate time to complete the planned firing operation due to changing fire conditions. (DIN-88, EIN-10.15)
19. The only plausible escape routes for the firing team was to the south on Mt. Gleason Road. (W-19)
20. There were no escape routes identified from Camp 16. (W-2, W-3, W-6, W-8, W-19, W-20, W-21, W-28, W-28)
21. Supt. 16 identified the kitchen/dining hall as the area of refuge if the fire impacted the camp. (W-1, W-2, W-3, W-6, W-8, W-11, W-12, W-19, W-20, W-21, W-28)
22. All personnel assigned to Camp 16 had confidence in, and responded to, the direction of their leadership. (W-2, W-3, W-11, W-12)

23. Supt. 16 requested two engines on Saturday, September 29<sup>th</sup> and E80 and E130 were assigned. A request was made and granted to have P80 assigned upon their arrival to Camp 16. No additional requests for resources were identified or expressed. (W-1, W-2, W-6, W-19, W-20, W-21, W-28, W-24, W-25, W-62)
24. Camp 16 was not identified as an asset at risk by the Station Fire Incident Management Team. (EIN-16)

### **Environmental**

25. Camp 16 personnel were aware of the changing weather conditions prior to the turnover. (W-2, W-3, W-5, W-11, W-12, W-20, EIN-10.15)
26. Actual fire behavior exceeded expected fire behavior when the fire impacted Camp 16. (W-2, W-3, W-4, W-5, W-6, W-7, W-8, W-9, W-19, W-20, W-21, W-28, W-28)
27. The plan to protect the camp did not evolve with the observed fire behavior prior to the burn-over. (W-2, W-3, W-4, W-5, W-6, W-7, W-8, W-9, W-19, W-20, W-21, W-28, W-28, EIN-10.15)
28. Personnel scouted the Station Fire in proximity to Camp 16 on a regular basis. (W-1, W-2, W-3, W-4, W-5, W-6, W-7, W-8, W-9, W-19, W-20, W-21, W-28, W-28)
29. Prior vegetation reduction occurred in proximity to structures in Camp 16. (W-20, W-28, EIN-10.15)

### **Material and Equipment**

30. All PPE was utilized and functioned properly. (DIN-98)

### **Human Factors**

31. CDCR personnel provided dinner early in anticipation of the fire's impact. (W-11, W-12, W-20, W-21, W-28)
32. Individuals who didn't have fire shelter training were provided PPE and shelters and instructed on how to use the fire shelters. (W-11, W-28, DIN-99)
33. Supt. 16 had all requirements for division/group supervisor except S-234 firing operations. (DIN-99)
34. E80 operator had difficulty transferring vehicle from pump to drive while attempting to retreat to a safer location. (W-1, W-6, W-7, W-20)

## **Fuels**

- 35. No record of fire history in the vicinity of Camp 16 for approximately 90 years. (*DIN-88, DIN-100*)
- 36. Fuel load was estimated at 40 tons per acre in the North Fork of Mill Creek Drainage. (*DIN-88*)
- 37. Fuel moistures were at critical levels for live and dead fuels. (*DIN-88*)
- 38. Live fuel moistures were estimated at 55%. (*DIN-88*)
- 39. One-hour dead fuel moistures were estimated at 2 to 4%. (*DIN-88*)

## **Topography**

- 40. Slopes on the south side of Mt. Gleason Road, below the camp, ranged from 50 to 80% with the average slope recorded at 70%. (*DIN-88*)
- 41. The south slope between the camp and Mt. Gleason Road averaged 90%. (*DIN-88*)
- 42. The southwest facing aspects typically have the highest fuel temperatures in the afternoon hours. (*DIN-88*)
- 43. Camp 16 was located on a ridge line between two prominent saddles. (*DIN-88*)
- 44. Mt. Gleason Road, below Camp 16, is a mid-slope road. (*DIN-88*)
- 45. There were three separate chutes from the North Fork of the Mill Creek drainage, below the ridge of Camp 16. (*DIN-88, DIN-96, DIN-97*)

## **Urban Interface**

- 46. Structures exposed over the Mill Creek drainage were built prior to 1956 with single pane windows, open eaves, common attic spaces and some had exposed combustible materials, such as decks. (*W-8, DIN-88, DIN-96, DIN-97, EIN-2.2*)
- 47. Stored firewood was moved away from the structures prior to the fire. (*W-19, W-20, W-28*)
- 48. Fuels and structures were pretreated with Class A foam prior to the fire's impact on the camp. (*W-8, W-19, W-28, EIN-2.2*)

49. Engine 80 was assigned to protect the in-camp inmate dorm and CDCR offices. Engine 131 was assigned to protect the kitchen/dining hall. Both engines were to protect the main dorm. Patrol 80 was assigned as a mobile resource. (*W-1, W-2, W-3, W-4, W-5, W-6, W-7, W-8, W-9, W-19, W-20, W-21, W-28, W-28*)

### **Weather**

50. The development and collapse of pyro-cumulous clouds to the northeast of Camp 16 caused strong erratic winds in the vicinity of the camp. (*DIN-88*)
51. At 1700 hours, the Mill Creek RAWS reported winds at 17 gusting to 45 mph. The Mill Creek RAWS is located 4 miles from Camp 16. (*DIN-88*)
52. On the afternoon of August 30, humidity was recorded at the Mill Creek RAWS between 3-8%. (*DIN-88*)
53. The Long Term Palmer Drought Index ending August 22, 2009 showed minus 4 or less (extreme drought) for the Angeles National Forest. (*DIN-88*)
54. 2009 is the third year of the drought condition. (*DIN-88*)
55. On August 30, the temperature in the North Fork drainage was mid 80s to mid 90s. (*DIN-88*)
56. For the week of August 25 to 31, all forecasted Burn Indices exceeded the 97 percentile. (*DIN-88*)

### **Motor Vehicles**

57. Supt. 16's vehicle was properly maintained. (*DIN-101*)
58. The Supt. 16 vehicle stayed on it's wheels after it left Mt. Gleason Road for approximately 600 feet. (*DIN-101*)
59. The Supt. 16 vehicle came to rest 734 linear feet below Mt. Gleason Road. (*DIN-101*)
60. The Supt 16 vehicle was located upside down with the roof collapsed into the passenger compartment. (*DIN-101*)
61. The windshield on W-1's vehicle cracked from heat and/or impact during burn-over. (*W-1*)
62. P80's exposed hose bed caught on fire during the burn-over. (*W-1, W-19, W-28*)

63. E80 and E130 sustained minor damage to plastics and paint during the burn-over and rescue operations.  
(W-8)



Witness #	Title/Assignment
1	Battalion Chief
2	Fire Captain E131
3	Firefighter E131
4	Explorer E131
5	Firefighter E131
6	Fire Captain E80
7	Firefighter E80
8	Firefighter Specialist E80
9	Firefighter E80
10	CDCR Captain
11	CDCR Correctional Officer
12	CDCR Correctional Officer
13	Camp Foreman
14	Firefighter E81
15	Fire Captain P81
16	Firefighter E81
17	Firefighter/Paramedic SQ111
18	Firefighter/Paramedic
19	Fire Captain P80
20	Camp Foreman
21	Camp Foreman
22	Camp Foreman
23	Fire Captain USAR 130
24	Battalion Chief
25	Battalion Chief
26	USFS Battalion Chief
27	Fire Captain E81
28	Firefighter P80
29	Firefighter E81
30	Firefighter P81
31	Firefighter USAR130
32	Fire Captain E130
33	Firefighter Specialist E130
34	Firefighter E130
35	Fire Captain
36	Assistant Chief
37	Division Chief
38	Staff Aid
39	Firefighter RA21
40	Firefighter RA21
41	Fire Captain P79
42	Fire Captain P79
43	BLM Firewatch 509
44	Safety Officer
45	Safety Officer
46	Camp Supt
47	Camp Supt
48	Camp Supt
49	Camp Supt
50	Camp Foreman

51	Structure Branch
52	Chief
53	Camp Foreman
54	Camp Foreman
55	Chief 16
56	Chief 15
57	Flight crew Copter 14
58	Pilot Copter 14
59	Chief
60	Battalion Chief
61	Battalion Chief
62	Battalion Chief
63	Fire Captain
64	Dispatcher
65	Battalion Chief
66	Supervisor Dispatcher
67	Supervisor Dispatcher
68	Dispatcher
69	Supervisor Dispatcher
70	Inmate
71	Inmate
72	Inmate
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119	Inmate
120	Inmate
121	Inmate
122	Inmate
123	Inmate
124	Inmate
125	Inmate
126	Inmate
127	Inmate
128	Inmate
129	Branch 4
130	Division Lima

## ***Causal and Contributing Factors***

### **Causal Factors**

Causal Factors are any behavior, omission, or deficiency that if corrected, eliminated, or avoided, probably would have prevented the incident.

1. The decision to protect Camp 16 and shelter in place and allow the firing operation was made at the Battalion Chief's management level without contact with the Station IMT.  
(Findings #1, #2, #4, #6, #12, #25, #27 and #28)
2. The lack of contact with the Station Incident prevented Camp 16 leadership from knowing about predicted fire behavior and available resources.  
(Findings #1, #2, #6, #8, #9, #24, #26)
3. The firing operation on the Mt Gleason road was not successful due to the extreme fire behavior which exceeded the prediction of the plan.  
(Findings #10, #16, #18, #19, #25, #26, #27, #40, #41, #43, #44, #45 and #50)

### **Contributing Factors**

Contributing Factors are any behavior, omission, or deficiency that sets the stage for an accident, or increases the severity of injuries.

1. The organizational culture allows firefighters to accept a notably higher risk to protect structures on wildland fires. A sense of ownership may have also influenced the decision to defend the facility.  
(Findings #4, #5, #6, #8, #9, #11 and #12)
2. The south winds aloft and prevailing up-canyon winds aligned with the topography of the North Fork of the Mill Creek drainage resulting in rapid fire progression toward Camp 16 and the firing team on the mid-slope road.  
(Findings # 40, #41, #43, #44, #45, #50, #51 and #56)
3. The fire burned in rugged terrain and the burnover occurred in the upper end of a steep drainage with fuel loads at seasonal low fuel moisture levels.  
(Findings # 36, #37, #38, #39, #40, #41, #42, #43 and #45)
4. Resources assigned to Camp 16 were utilizing two different frequencies for tactical discussions and reports. Effective communication controls were not in effect prior to the incident.  
(Findings #7 and #10)
5. There was no lookout dedicated to the firing operation.  
(Finding #16)

6. The Station Fire IMT was either unaware of the threat to Camp 16 or understaffed to provide any assistance.  
(Findings #1, #2, #4, #8, #9 and #24)
7. The ninety-year period of no fires in the vicinity of Camp 16 provided no historic baseline for reference.  
(Findings #35, #36, #37 and #38)

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## **PRELIMINARY SUMMARY REPORT**



### **Camp 16 Incident Vehicle Accident and Fatalities**

**August 30, 2009**

**CA-LAC-09196997**

This Preliminary Summary Report is intended as an aid in accident prevention, and to provide factual information from the first 24 hours of the accident review. To that end it is published and distributed within a short time frame. Information contained within may be subject to revision as further investigation is conducted, and other reports and documents are received.



## **SYNOPSIS**

On the afternoon of Sunday, August 30, 2009, at approximately 1645 hours, a County of Los Angeles Fire Department, Fire Captain and Fire Fighter Specialist were involved in a single vehicle accident near Los Angeles County Fire Camp 16 (Near Mt. Gleason).

Both firefighters died as a result of their injuries.

Several other firefighters received burn and smoke inhalation injuries while trying to get to and render aid to the firefighters who were involved in the vehicle accident.

## **NARRATIVE**

The fire was rapidly approaching the Fire Camp from the South East with extreme fire behavior when the accident occurred. The sudden increase in fire behavior also resulted in the burn-over of the Fire Camp destroying the majority of the Camp.

At the time of the burn-over, approximately sixty-five fire fighters were involved in the protection of the Fire Camp and many were forced to seek refuge from the fire at various locations at the Fire Camp.

The Fire Captain and Firefighter Specialist were involved in an operation protecting the Camp from the rapidly approaching fire. They entered their vehicle and were in the process of leaving the immediate area when the accident occurred. Their vehicle left the roadway resulting in the fatalities.

Several firefighters received burn and smoke inhalation injuries while trying to get to and render aid to the firefighters who were involved in the vehicle accident. The injured firefighters were transported to local hospitals where they were treated and released.

## **RECOMMENDATIONS FOR IMMEDIATE CORRECTIVE ACTIONS**

Have adequate resources available to support all emergency operations at all times.

Maintain current information on fire weather forecasts and expected fire behavior.

Identify safety zones and escape routes, and update them regularly.

Maintain Situational Awareness and know what the fire is doing at all times.

Identify trigger points which allow for adequate time to evacuate after receiving notification by posted lookouts.

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## INFORMATIONAL SUMMARY REPORT



### **Camp 16 Incident Vehicle Accident and Fatalities**

**August 30, 2009**

**CA-LAC-09196997**

This Informational Summary Report is intended as an aid in accident prevention, and to provide factual information from the first 72 hours of the accident review. To that end it is published and distributed within a short time frame. Information contained within may be subject to revision as further investigation is conducted, and other reports and documents are received.

## **SYNOPSIS**

On the afternoon of Sunday, August 30, 2009, at approximately 1645 hours, a County of Los Angeles Fire Department, Camp Superintendant (Fire Captain) and Camp Foreman (Fire Fighter Specialist) were involved in a single vehicle accident near Los Angeles County Fire Camp 16 (near Mt. Gleason).

Both firefighters died as a result of their injuries.

72 additional personnel were assigned to provide structure protection for Fire Camp 16 and they were forced to use structures, vehicles and fire shelters for protection from the rapidly approaching fire front.

These additional personnel included 2 Type 1 Engine Companies, 1 Type 4 Patrol, 1 Battalion Chief, 3 Crew Foreman, 3 California Department of Correction and Rehabilitation employees and 55 inmate firefighters.

Several of the personnel received injuries while trying to access and render aid to the firefighters who were involved in the vehicle accident and during the sheltering events.

## **NARRATIVE**

On Saturday, August 29, the decision was made to evacuate all non-essential personnel from Fire Camp 16 due to the advancing fire front. A plan for defending the camp was developed and briefed to all of the remaining personnel.

On Sunday, August 30, 2009 at approximately 1500 hrs, personnel gathered at the camp helipad and observed fire to the west of the camp. At approximately 1530 hours, the decision was made to feed the inmate firefighters in anticipation of increased fire activity.

At approximately 1615 hours the fire conditions around the camp began to deteriorate very rapidly. There was an increase in temperature and wind speed. The decision was made to "shelter in place" the inmate firefighters while the engines and patrol were deployed as per the briefed plan.

During this time frame the Camp Superintendant and Camp Foreman drove to the area of the helipad and began a firing operation that was part of the briefed plan.

At approximately 1630 hours the dining facility was becoming untenable due to fire involvement. The order was given to the inmate firefighters to prepare fire shelters for deployment.

At this point there was radio traffic from the Battalion Chief advising all personnel to move to the north of the dining facility where there were better conditions. The personnel moved to the north with some utilizing their shelters to protect themselves. When they arrived at the crew transports they were directed to enter the transports for additional protection.

At approximately 1715 hours an accounting of all personnel began and it was determined that two personnel were missing. A search of the area was started for the missing individuals and their vehicle.

A short time later the missing vehicle was located approximately 800 feet below the road and it was determined that both the Camp Superintendant and the Camp Foreman had received fatal injuries.

### **CONTINUED SAFETY CONSIDERATIONS FOR EXTREME FIRE BEHAVIOR**

Have adequate resources available to support all emergency operations at all times.

Maintain current information on fire weather forecasts and expected fire behavior.

Identify adequate safety zones and escape routes, and update them regularly.

Maintain Situational Awareness and know what the fire is doing at all times.

Identify trigger points which allow for adequate time to evacuate after receiving notification by posted lookouts.

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## ***Fire Behavior***

### ***Introduction***

The “Station Fire” was a large fire which burned primarily in the Angeles National Forest located north of Los Angeles, California. This fire proved to be the largest wildland fire Los Angeles County history. The non-Santa Ana wind fire behavior driving the Station Fire was responsible for the fire burning over 160,000 acres and was a key contributing factor into the deaths of two Los Angeles County firefighters, several other firefighter injuries and the total destruction of a large fire camp.

The accident that occurred in the late afternoon on August 30<sup>th</sup>, 2009 was the result of multiple fire environmental elements coming into alignment at the same time producing the single highest day growth in fire size during the progression of this incident.

The fire behavior during the Camp 16 incident was:

- Predominately a fuel/topography driven event.
- Under a plume dominated environment.
- Exhibiting record high temperatures, low humidities, and extremely dry fuels.

The following report was prepared to document how and why all these fire elements came into volatile alignment and resulted in the extreme fire conditions experienced at Camp 16 during the Station Fire.

### ***Weather***

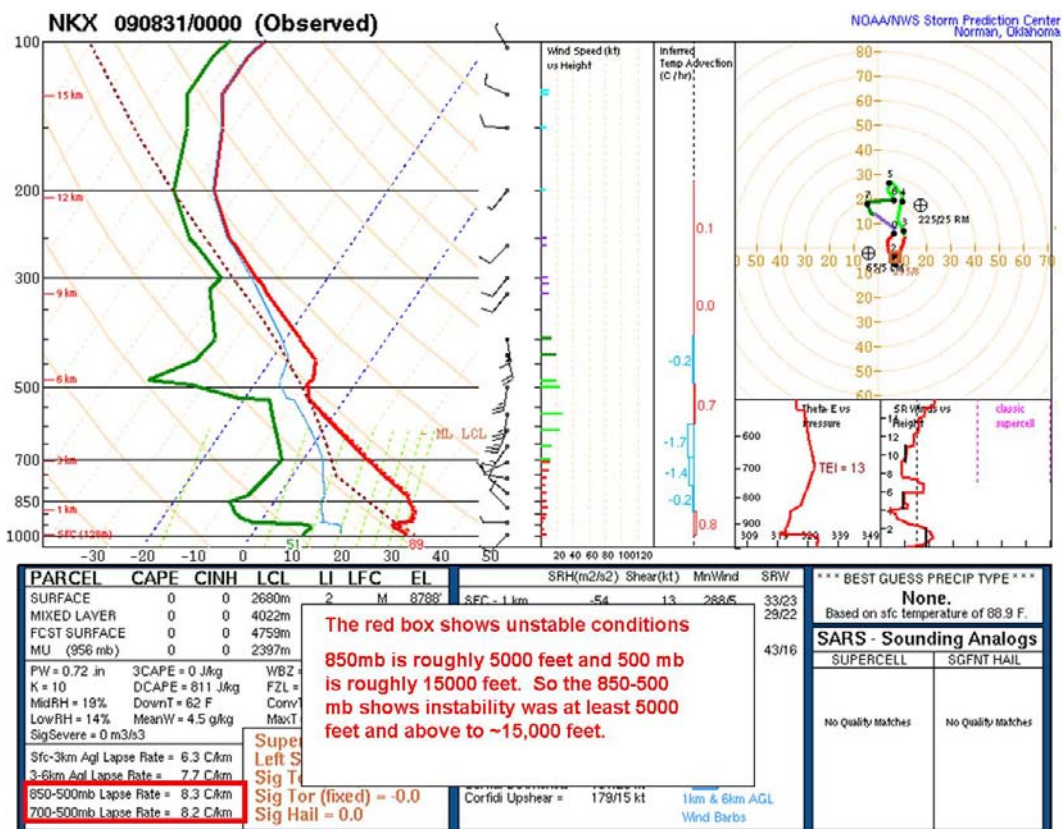
#### ***Findings: Fire weather contributed significantly to this event.***

The large scale weather pattern over the Station Fire on August 30<sup>th</sup> can be characterized by a broad upper level high pressure system, extending from the desert southwest to Southern California. The upper level high pressure had been in place for a few days leading up to August 30<sup>th</sup>. As a result, triple-digit high temperatures with relative humidities in the single digits to lower teens were commonplace at the Station Fire.

On the morning of August 25<sup>th</sup>, the National Weather Service (NWS) in Oxnard issued a Fire Weather Watch to account for the long duration single digit humidity, hot temperatures and critically dry fuels. The Fire Weather Watch was in effect through Friday evening, August 28<sup>th</sup>. The Fire Weather Watch was later upgraded to a Red Flag Warning with a valid time of 0600 Wednesday, August 26<sup>th</sup> through August 31<sup>st</sup>, Monday at 2100 hours. It should be noted that Red Flag Warnings are only issued when critical fire weather conditions are either occurring or will be shortly.



The atmospheric conditions over the Station Fire were unstable. This was noted by several days of plume dominated fire behavior with large pyro-cumulus clouds. Despite broad high pressure overhead, upper atmosphere (radiosonde) soundings (1700 hrs, August 30<sup>th</sup>) indicated unstable air aloft with little or no inhibition from 5,000 feet to 15,000 feet in elevation. This view is from Alta Dena looking North at 2:15 the afternoon of August 30.



This is the data report for the Vandenberg sounding taken on the afternoon of August 30<sup>th</sup>, 2009. The upper left portion of this report shows a red line within the chart moving to the left as it goes up the chart. The angle of this line moving to the left shows the air mass is cooling quickly as measured when the balloon gained altitude, thus this chart indicates an unstable air mass above 5000 feet. The green line on the left side of the same chart indicates that the air mass also rapidly dried out above 5000 feet in elevation.



*The unstable air mass was further confirmed by ACARS (Aircraft Communications Addressing and Reporting System) temperature profiles from airplanes landing and departing LAX airport.*

*The lack of an inversion, unstable air aloft combined with intense heating generated by the fire at the earth's surface allowed for free convection. Numerous large pyro-cumulus columns resulted with developed ice caps appearing on top of each column. NASA imagery on August 30<sup>th</sup> indicated pyro-cumulus development of at least 23,000 feet in elevation over the fire.*

### ***Unstable Air and winds***

Well developed pyro-cumulus clouds and dense surface smoke most likely caused a slight cooling of ambient air temperatures due to reduced solar radiation sunlight reaching the earth's surface.

Afternoon temperatures in the Upper North Fork Mill Creek Drainage were in the upper 80's to middle 90's as referenced by the Mill Creek and Camp 9 Remote Automated Weather Stations (RAWS). The Mill Creek RAWS is located four miles east of the accident site at an elevation of 5020 feet. Camp 9 RAWS is located eleven miles west at 4000 feet.

The general wind flow over the Station Fire from ignition through August 30<sup>th</sup> had a typical diurnal trend of north to northeast in the early morning hours and south to southwest during the afternoon.

The strongest winds generally occurred during the heat of the day (1400-1700 hours) with some influence from the sea breeze pushing inland. Strongest winds were realized over the ridges, upper slopes, southwest facing aspects and southwest to northeast oriented drainages.

Due to the complex and broken terrain found within the Upper North Fork Mill Creek local winds were generally terrain driven upslope to up canyon during peak heating (1400 to 1800 hours). The Mill Creek drainage south to north orientation combined with daily southwest gradient winds would most likely enhance any upslope/up canyon wind flow.

The Mill Creek RAWS recorded general afternoon wind speeds between four and sixteen miles per hour (mph) with gusts sixteen to twenty-nine miles per hour.

Wind speeds and direction became very erratic at 1700 hours on August 30<sup>th</sup> when the wildfire burned over the Mill Creek RAWS. Wind speeds at this time were 17 mph gusting to 45 mph.

These erratic winds were caused when multiple pyro-cumulus columns developing and collapsing simultaneously during the day of August 30<sup>th</sup> over-powered local and general winds. Downdrafts from the column collapses resulted in erratic wind gusts exceeding 30 mph (as reported by Shelly Crook, Fire Behavior Analyst (FBAN) for the Station Fire Incident Management Team).

### ***Humidities***

The Long Term Palmer Drought Index ending August 22<sup>nd</sup>, 2009 shows minus 4 or less (extreme drought) for the Angeles National Forest. 2009 is the third year of this current drought condition.

The minimum relative humidities (RH %) ranged between 3 and 8 percent as referenced by the Mill Creek and Camp 9 RAWS on August 30<sup>th</sup>. The morning of August 30<sup>th</sup> the maximum relative humidity recovery was 20 percent. This night time humidity recovery is considered extremely poor.

### ***Fuels***

#### ***Findings: Fire fuel states contributed significantly to this event***

Fuel data shows that both dead and live fuels were at critically dry levels. Fuel loadings were heavy. Nearly all this fuel load was available to burn at record high intensities. Field observations confirm nearly complete combustion of all fuels, live and dead within the North Fork of Mill Creek drainage in the area of Camp 16. Very few islands of unburned fuel can be found within the interior of the Station Fire.

## ***Fuel Load***

The fifty year recorded fire history for the Angeles National Forest shows no recorded fires within the North Fork of Mill Creek Drainage and Gleason Canyon drainage to the northeast of the Fire Camp 16 area. Chaparral older than thirty years old is considered highly flammable in Southern California fire ecology due to increasing dead to live component and total biomass volume of the brush.

Fuel loading of the chaparral brush located within the North Fork of Mill Creek was estimated to be 35 to 40 tons per acre. Fire behavior prediction Fuel Model #4 models only 23 tons per acre. (Fire Captain Drew Smith, Los Angeles County Fire Department - Prescribed Fire and Fuels Manager/FBAN).

The Ponderosa Pine trees within the Camp 16 compound and the Gleason Canyon drainage averaged sixty feet in height. The trees within the Camp 16 compound were pruned to a height of 8--12 feet. The trees outside Fire Camp 16's compound perimeter averaged a crown base height of 2 - 4 feet. The spacing between trees outside the compound was estimated to be 8 - 12 feet and the crowns were interlocking. The forest vegetation on the Gleason Canyon drainage is best represented by Fuel Model 10.

Evidence shows that long leaf needle litter depth within the Camp 16 compound prior to the fire on flat ground was shallow and other places nearly non-existent (bare ground).

## ***Fuel Moisture***

Brush species present at the accident site include Chamise, Ceanothus, Manzanita, Scrub Oak, Toyon and Yucca. Tree species at the accident site include Interior Live Oak, Ponderosa Pine, Coulter Pine, and Big Cone Douglas-Fir.

Live Fuel Moisture (LVFM) recorded at the Peach Motorway on August 15<sup>th</sup>, 2009 was 63 %. 60% LVFM is considered "critical" for chamise, the primary brush species carrying the fire's spread. The fifteen days prior to August 30<sup>th</sup> and the hot, dry weather that began on August 25<sup>th</sup> further likely decreased the LVFM another 5%.

1-Hour fine dead fuel moistures (FDFM) (0 to 1/4" diameter) were estimated to be between 2% - 4%. BEHAVE PLUS (a wildland surface fire behavior modeling program), with a correction factor, indicated FDFM of 4%. However, the extremely hot, dry weather with poor night time RH recovery and the reported area ignition and prolific spotting at the accident site indicates lower 1-Hour dead fuel moistures of 2%.

10-Hour RAWs dead fuel moisture (1/4" to 1") on the afternoon of August 30<sup>th</sup>, 2009 was 4% at Los Angeles County Fire Department Camp 9 and 3% at Mill Creek.

100-Hour fuels dead fuel moisture (1' to 3'') averaged 4% ,and 1000-Hour dead fuel moisture (3'' to 8'') averaged 6%. These dead FM levels are historic record lows from 1976 to 2009 within this identified area. [Reported from the Southern California Geographic Coordination Center (SCGCC), for the Western Mountains Predictive Service Area (PSA) Special Interest Group (SIG)]

### ***PSA SIG Data***

A PSA SIG is a grouping of Remote Automated Weather Stations within a defined region with similar environmental characteristics that helps provide a better overall picture of current fuels and potential fire attributes. Both of these reported dead fuel moisture levels are historic record lows for this data set that extends from 1976 to 2009 within this identified PSA SIG.

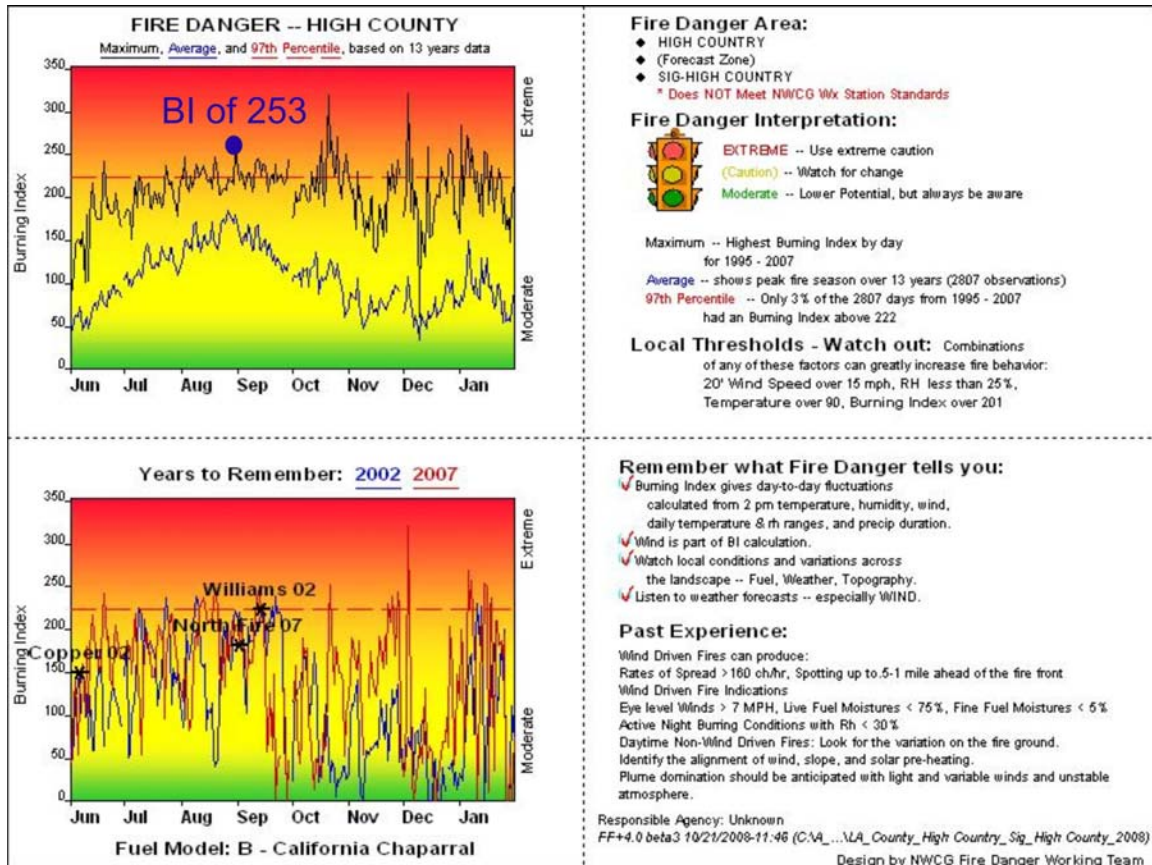
The Burning Index (BI) is a number used to describe the potential amount of effort to contain a single fire within a particular fuel type within a rating area. It is a function of the Spread Component and Energy Release Component (ERC), and is recognized as an excellent indicator of fuel flammability within the Shrub Fuel Group.

The Station Fire had historic record high BI's on August 25<sup>th</sup> to August 31<sup>st</sup>. The BI calculation is heavily weighted by the forecasted wind speed in the spread component part of the BI equation. Since strong winds were not forecasted, these historic record high BI's are considered extraordinary.

DATE	Forecasted BI	97 <sup>th</sup> Percentile
8/25/09	228	222
8/26/09	270	222
8/27/09	260	222
8/28/09	241	222
8/29/09	250	222
8/30/09	253	222
8/31/09	262	222



## NWCG Fire Danger Pocket Card – High Country of the Angeles National Forest



*This NWCG Fire Danger Pocket Card for the High Country of the Angeles National Forest provides a graphic representation of the historic BI's averages and maximums for each month of the year. The BI for August 30<sup>th</sup>, 2009 of 253 is clearly above the maximum recorded for this date.*

## *Topography*

### *Findings: Topography played a significant role in this event*

Fire Camp 16 is at 5,600 feet elevation, located on top of a ridge that runs slightly northwest to southeast between the North Fork of Mill Creek and the Gleason Canyon drainages. Mount Gleason is located 1.6 miles due west of Camp 16.

Surrounding Camp 16 there are several chutes, saddles and draws in a high slope environment that contributed to the severity of fire conditions during the accident.

### *Slope*

Slope measurements were taken with a clinometer from the Mount Gleason Road located adjacent to the west side and down slope from Camp 16. These measurements ranged from 50% at the accident site where the truck went off the road to 80% looking down into the North Fork of Mill Creek drainage. The average slope in the chutes running up to the Mount Gleason Road was 70%.



*This photograph was taken from the mid-slope Mount Gleason Road looking down Chute B3. The slope for this chute is 70%. These chutes channeled super heated gas and fire on the afternoon of August 30<sup>th</sup>.*



## *Chutes*

Fire runs up chutes similar to how water flows down toward creek bottoms. Rate of Spread (ROS) for this fire in these chutes would be expected to be extreme (2 to 4 mph) because of the very steep slopes, upslope/up canyon winds and unstable atmosphere occurring at the same time when fuel moistures are critically dry.

The principle chute leading to the shelter-refuge site (B-2) has a straight line bearing of 212 degrees from the Mount Gleason Road down to the bottom of canyon in the North Fork of Mill Creek drainage. The horizontal distance of this chute is 2,135 feet, and the elevation difference between the bottom of the canyon and the Fire Camp 16 is 2,275 feet. The average slope for this identified chute is 106%.

The slope measurement for the area between the Mount Gleason Road and Fire Camp 16 (above chute B-2) was 90%.

Steeper slopes result in more efficient pre-heating of up-slope vegetative fuels. The convective energy is transferred to the vegetation instead of being lost to the atmosphere, causing significantly faster rates of fire spread. A significant convective force was created within these steep chutes channeling super heated gases and firebrands towards the west side of Camp 16.



*This photograph is of Chute B2 which was the principle Chute leading to the refuge site. The building on the left (the saw shop) was the only building to survive. The parking area to the left proved to be the safe refuge for the crew vehicles during the burn over.*



*The extent of superheated gases passing through Camp 16 at the time of the burn over was tremendous as evidenced by patches of remaining foliage showing signs of needle freeze*

Needle freeze observations taken throughout the Camp 16 compound clearly indicate the dominant direction of super heated gases came from the chutes and slopes in the North Fork of the Mill Creek drainage. Needle freeze on the northeast side of the camp in the timber fuels also indicate super heated air flow from the North Fork of Mill Creek side of the camp.

Conifer trees located on very steep slopes (even in the absence of ground and surface fuels) are still subject to torching and crowning since there is increased efficiency in convective heat transfer on steeper slopes. Superheated gases continue to follow the slope in a straight line fashion when the slope is aligned in a more vertical orientation.

The general and slope winds were in alignment with each other. Steep terrain was the main environmental factor, but the buoyancy of the unstable air mass created a much stronger convective force than normally might be found on wildfire in steep terrain.

The chutes from the North Fork of Mill Creek leading towards Camp 16 were on southwest facing aspects. The fuels on these slopes would normally be expected to have the highest fuel temperatures and lowest fuel moistures in the afternoon hours of August 30<sup>th</sup>, 2009. The shading on fuels from the pyro-cumulus clouds may have had no limiting effect on fire activity due to the extremely hot and dry conditions. These fuels were already at historic critically dry levels with the Red Flag low humidity and high temperature conditions.



*Southwest facing chutes B1 and B2 lie below Camp 16. Mount Gleason Road is dirt road to the left, Camp 16 lies above it.*



## *Saddles*

Two dominant saddles were identified near Camp 16. One was located at the southeast end (in close proximity to the high tension power transmission lines) and the other at the northwest end of the Camp 16 site (denoted in this report as the Gleason Canyon Saddle).

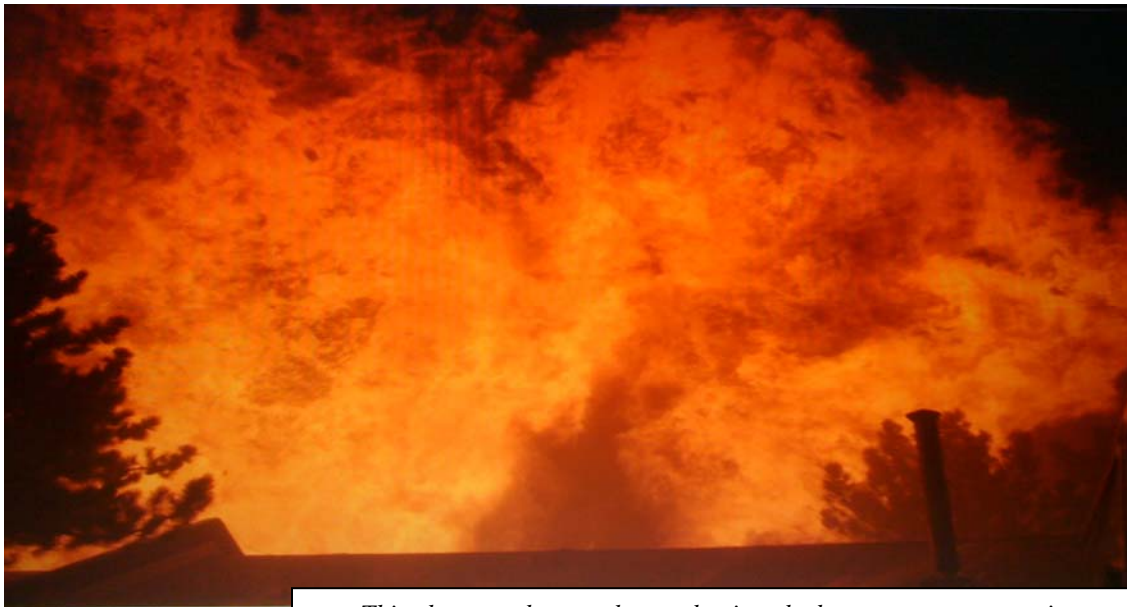
Saddles are places where winds are funneled through topographic features resulting in increased wind speed like a venturi effect. These two saddles funneled the wind and wildfire up the North Fork of Mill Creek drainage directly towards the Camp 16 compound.



*This photograph was taken from the mid-slope Mount Gleason Road looking down Chute B3. The slope for this chute is 70%. These chutes channeled super heated gas and fire on the afternoon of August 30<sup>th</sup>.*

### *Other Topographical Features*

The Mount Gleason Road is a mid-slope road even though it is located near the top of the ridgeline. Fire and/or super heated gases would rapidly traverse uphill over this road towards Camp 16 without any deterrence. The Station Fire was fuels/topography driven, and the greatest energy releases occurred during uphill runs. Photographic evidence taken at the time of the burn over shows the flame front coming from the North Fork of Mill Creek Canyon cresting over a Camp 16 structure at a location above the mid slope road. Dimensions of the flame length cannot be determined from the photograph but flame lengths of 80 to 120 feet would be consistent with videos of fire runs in other areas of the Station Fire and from witness accounts of personnel at Camp 16 at the time of the burn over. This conclusion is also based on the known fuels, weather and topographic conditions that existed at the time of the occurrence. Conditions for fire personnel working off of this mid slope road would have been un-survivable during the time of fire passage.



*This photograph was taken at the time the burn over was occurring, and the flaming front from the North Fork of Mill Creek Canyon was passing over one of the buildings within Camp 16.*

The northeast to southwest ridgeline running through Camp 16 was subject to the general and upslope/up canyon winds flowing nearly perpendicular in some places to the main ridgeline resulting in eddying and turbulent winds on the lee or northeasterly aspect. These turbulent winds would likely have pushed spot fires back upslope towards Fire Camp 16 from the timbered Mount Gleason Plantation located on the east side of the Camp.

### ***Fire Camp 16 as an intermix structure environment***

Many of the Camp 16 buildings were located at the apex of the steep slopes. They were in the most direct alignment for the head fire runs that came out of the North Fork of Mill Creek drainage. This alignment allowed for the force of the super heated gases to blow out the windows on the west facing building walls. These structures rapidly ignited and provided fuel for additional energy release within Camp 16.

Evidence indicates that most of the buildings were rapidly ignited within 45 seconds to 1 minute after the fire's run from the North Fork of Mill Creek drainage side of the Camp. These buildings, due to their location and the existing fire environment on the afternoon of August 30<sup>th</sup>, made "stay and defend" tactics ineffective.



*View of the 90% slope between Camp 16 and the Mount Gleason Road. Notice the Camp's structures located at the apex of the steep slope, and the number of windows facing the North Fork of Mill Creek drainage.*

### ***Fire Rates of Spread***

The fire behavior prediction models such as BEHAVE PLUS and FARSITE are considered not applicable in a plume dominated fire since fire growth occurs in all directions. However, BEHAVE PLUS appears to have modeled fire growth and flame lengths quite well in the chutes of the North Fork of Mill Creek below Camp 16 when the assumption was made that the fire was creating its own weather, and as a result totally dominated local wind and slope vectors in a free convection blow up condition. These model runs assumed a maximum fire spread upslope in the direction of the wind (fire created) regardless of the orientation of the chute to prevailing winds aloft. The results of this modeling matched the general observations by individuals on site during the afternoon of August 30<sup>th</sup>. Plume dominated fires by definition create their own weather so these assumptions are not unreasonable. The unstable air mass above 5,000 feet in combination with the extremely steep slopes, and critically dry heavy fuel load in the 1-HR, 10-HR and 100-HR fuels resulted in rapid fire spread upslope in each chute.

Maximum ROS for fire runs at the time fire crossed the mid-slope road below Camp 16 were calculated to be between 260 and 300 feet per minute (3.0 to 3.4 MPH respectively). These estimates of the fire's rate of spread need to be interpreted with caution because they are model averages, and the rate of spread likely did not remain constant during the entire run up each chute. Rates of spread could have easily ranged from 150 to 600 feet per minute as a function of energy release, fuels, topography, and weather effects for each localized point along the fire's path of travel. However, evidence does indicate that the fire started to make a run up toward Camp 16 at 1634 hours and reached Camp 16 between 1642 and 1644 hours.

Using the distance from the canyon bottom to the mid-slope road, the maximum ROS of the fire run toward Camp 16 was calculated as 260—300 ft per minute, or 3—3.4 mph. These results are averages of model data.

Rates of spread could have varied during this fire run from 150—600 ft per minute based on changes in the energy release, topography, fuels, and weather. Evidence indicates that the fire run toward Fire Camp 16 began at 1634 and reached Camp between 1642 and 1644 hours, which is 8—10 minutes. BEHAVE PLUS estimated the fire run to take 9—12 minutes, validating the fire model for this fire run.

Flame Lengths (FL) in the chaparral (Fuel Model 4) were calculated to be approximately 40 feet. However, these calculations do not account for the Scrub Oak and scattered conifers where torching could easily range from 60 to 200 feet.

The fire line intensity for maximum rates of spread calculated to be approximately 15,000 BTU/ft/second at the flaming front.

Downhill or backing fire against upslope winds were observed by Drew Smith (Los Angeles County Fire Captain/FBAN) to be approximately 200 feet per hour in chaparral. Associated flame lengths were 8 to 12 feet.

Maximum spotting distances were observed by FBAN Drew Smith to be between one-half and one mile distance. These observations are supported by the towering convective pyro-cumulus clouds carrying and distributing large ignited fire brands in all directions.

The high Probability of Ignition (PIG) indicates that spot fires would be frequent at any time that receptive fuels were available, thus creating conditions where area ignition could be possible. Computed Probability of Ignition (PIG) on the afternoon of August 30<sup>th</sup>, 2009 was 90 to 100%.

## ***Conclusion***

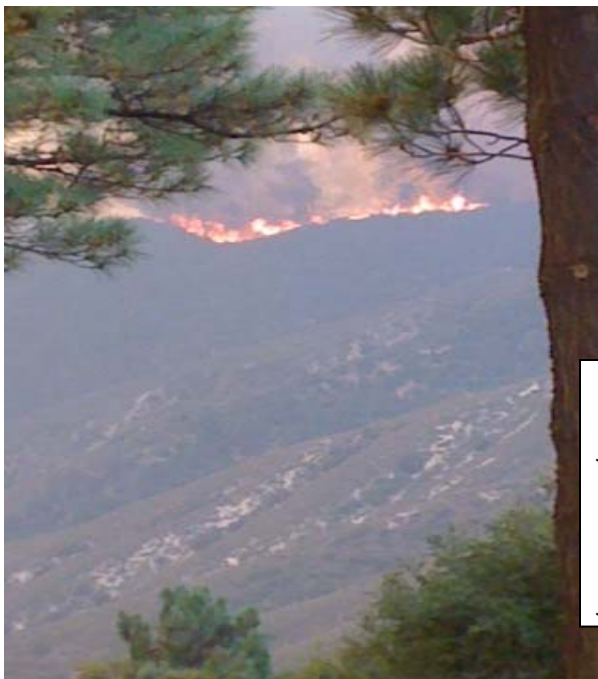
### ***Sequence of Events:***

1. A mild inversion was present in the early morning hours of August 30<sup>th</sup>, 2009 and broke up mid-morning. This statement is supported by evidence and the Fire Weather Forecast for the Incident Action Plan for that same day.
2. Firewatch 509 (an aerial observation rotor wing aircraft) reported the Station Fire front to be cresting the ridge just south of Fox Creek approximately two miles due south of Mount Gleason at approximately 1100 hours on August 30, 2009. The fire's growth was in a north to north east direction, in alignment with the south winds aloft. The fire likely spotted well into Fox Creek Canyon after making a run to the top of this ridge.
3. Firewatch 509 reported the fire front to be on the spur ridge southeast of Mount Gleason at 1230 hours on August 30, 2009.
4. Evidence clearly indicates that Camp 16 personnel knew that the fire was coming in their direction, and that it was taking hours to do so. Please note that Area A on the Fire Behavior Map has three ridges that are not in topographic alignment with the prevailing south winds. Also, note that the direction of the line of travel, which is in a north to northeast direction, is less than 5,000 feet in elevation. This height was below the elevation where the air mass was known to be unstable on the afternoon of August 30<sup>th</sup>. The fire's rate of spread was well under one mile per hour between these two points. This slow rate of spread would be consistent for a fuels/topography driven fire where wind direction and topography were not in complete alignment, and where the air mass is known to be more stable.





*Photograph taken from Camp 16 at approximately 1138 hours shows the fire burning on the top of the ridge as described by Firewatch 509. At this point in time the fire is proceeding up Fox Creek to the Lightning Point Ridge as indicated by the smoke column behind the ridge.*



*Photograph taken from Camp 16 at approximately 1218 hours showing the fire cresting the lower portion of Lightning Point Ridge. The tremendous flame lengths indicate that the fire at this time was finishing its run up towards Lightning Point Ridge from the Fox Creek Canyon.*

5. On a much larger scale, on the afternoon of August 30<sup>th</sup> the Station Fire was exhibiting extensive plume domination where two very large pyro-cumulus clouds were observed on NASA space imagery. Fire Behavior Analyst Drew Smith was near Soledad Canyon Road in the Acton Camp area on the afternoon of August 30<sup>th</sup>. He observed one of these large pyro-cumulus clouds over Mount Gleason and extending north towards his location. The fire, well north of Mount Gleason, was very active on that afternoon and was moving in an easterly direction. This observed large convective column would be expected to have a direct influence over the fire development in the North Fork of Mill Creek Canyon. The vertical updrafts would have likely pulled air up towards the Gleason Canyon Saddle similar to a large environmental vacuum. In addition, the south winds aloft and prevailing up-canyon winds are in clear alignment with the approximately 3.5 miles of the upper reaches of the North Fork of Mill Creek. These two large scale influences were funneling fire directly up the North Fork of Mill Creek Canyon towards Camp 16 on the afternoon of August 30<sup>th</sup>. Evidence clearly shows significant winds funneling through the Gleason Canyon Saddle at approximately 1608 hours with estimated wind speeds of at least 10 to 20 mph, as judged by the degree of bend in the trees and brush being pushed by the wind.



*This is the Gleason Canyon Saddle standing on the Mount Gleason Road looking due south down the Upper North Fork of the Mill Creek Drainage. Notice the north/south alignment of this canyon which would allow afternoon up-canyon winds and winds aloft from the south to funnel directly through the saddle which is located directly behind the photographer taking this photograph. Chute A1 is located in the foreground of this photograph.*

6. Analysis and evidence indicates that fire moved up the west side of the North Fork of Mill Creek Canyon in close proximity to the canyon bottom. The fire would have been expected to be well seated deep along the western side of the canyon bottom by approximately 1625 hours. It does not appear in any of the available evidence that the fire had become established on the eastern side of the drainage directly below Fire Camp 16 until approximately 1624 hours at the earliest. The likelihood that the first of many fire brands starting to pepper the eastside of the drainage would have been high (predicted Probability of Ignition of 90 to 100) by approximately 1620 hours. Many of these newly fallen fire brands would have been in the smoldering/ignition phase which would soon result (2 to 10 minutes later) in the development of new spot fires where receptive fuels were available. Since the main fire had been traveling (since at least 1100 hours) in a northeast direction up towards the west side of the canyon prior to approximately 1625 hours, a logical conclusion would be then that the fire would progress along the western slope of the canyon bottom prior to any slope reversal to the east side of the canyon.

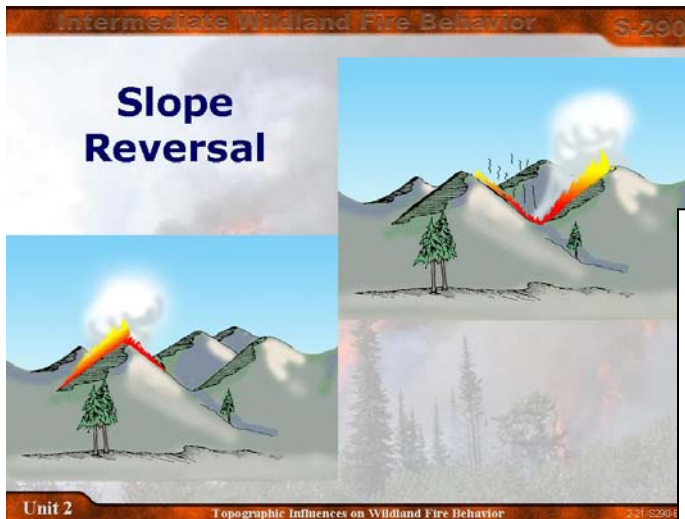


*This is adjacent to the Mount Gleason Road at the top of Chute B3 looking south down the Upper North Fork of Mill Creek Canyon. Analysis indicates that the fire was likely to have been well established along the entire right hand side (western side) of the of the creek bottom by approximately 1625 hours.*

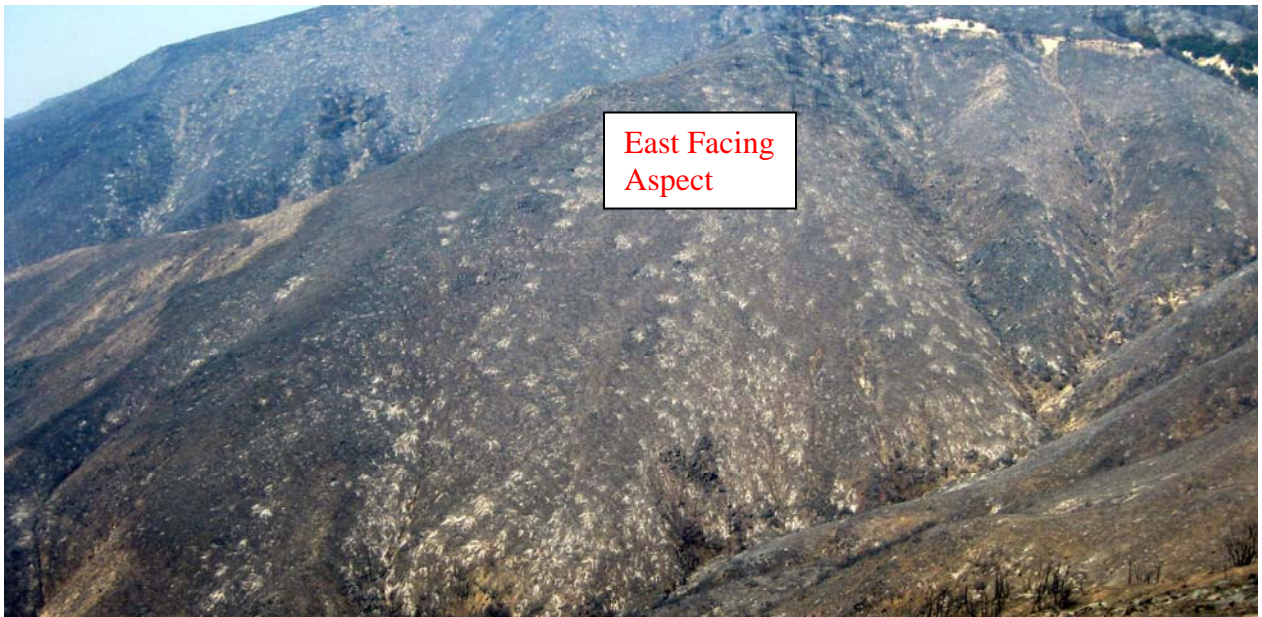
7. The fire's approach in the upper reaches of the North Fork of Mill Creek Drainage traveled up from the west side of the canyon bottom prior to any slope reversal to the eastern side of the canyon. This conclusion is based on the burn pattern on the opposite (western) side of the canyon which shows that the fire traveled upslope from near the canyon bottom to the top of the ridge.



The burn pattern consisted of small trees that all fell in the downhill direction pointing towards the direction of the oncoming fire. The up-canyon winds and the orientation of the chutes located on the western side would have accelerated this process.



This graphic depicts the fire behavior phenomenon called slope reversal. The graphic in the lower left shows a fire that has burned to the ridgeline and begins slowly backing down the opposite slope. The diagram in the upper right hand corner shows the same fire now well established in the canyon bottom and making a rapid up hill fire run to the next ridge top.



*This photograph was taken from the Mount Gleason Road looking due west across the Upper North Fork of Mill Creek Canyon at the opposite ridge of the canyon. Notice the white ash marks on the opposite ridge. All of these ash markers are residue from Oak trees completely consumed by the fire, and they point in a fanned out direction pointing downhill indicating the direction that the fire was traveling from. Also, notice the orientation of the chutes on the left hand side of the photograph. The openings of these chutes are facing in a southeast direction which would also allow prevailing up-canyon winds from the south to push fire upslope to the ridge top.*

8. The elevation of Camp 16 is 5,600 feet and the air mass was shown to be more unstable above 5,000 feet. This condition would mean that the air mass was more stable in the lower one third of the North Fork of Mill Creek Canyon and more unstable for the upper two thirds of the canyon. This would result in the heat and smoke generated by the fire to become increasingly more buoyant as the fire traveled upslope towards Fire Camp 16.
9. Evidence indicates that a spot fire was noted at 1624 hours in the canyon below Camp 16. Evidence also indicates that fire made a run upslope towards the western end of the Mount Gleason Canyon Saddle at approximately 1629 hours. Analysis indicates that the base of this run appears to have been located very near the 5,000 foot elevation marker. Fire was first pushed up to the top of the Upper North Fork of Mill Creek Canyon near the Gleason Canyon Saddle due to the topographic alignment with prevailing afternoon up-canyon winds and southerly winds aloft.



*This photograph was taken at the top of Chute B3 on the Mount Gleason Road looking across the Upper North Fork of Mill Creek Canyon towards the western most extent of the Gleason Canyon Saddle as well as the top of Mount Gleason. The chute on the right side of the photograph that is just below where the road exits the photograph is the chute that evidence shows carrying the fire run at approximately 1629 hours. Evidence and fire behavior analysis indicate that the chutes west (left) of this documented fire run were likely experiencing fire runs very close to this point in time since fire was already well seated on the west side of the Upper North Fork of Mill Creek Canyon.*

10. Available evidence indicates that this was likely the first noted upslope fire run (at approximately 1629 hours) witnessed by fire suppression personnel stationed at Camp 16. This fire run occurred in the Upper North Fork of Mill Creek which was in close proximity to Camp 16. Whether the extent of this run was along the entire west wall of the Upper North Fork of Mill Creek Canyon is unknown. However, this fire run was the trigger for Los Angeles County Fire Department Superintendent 16 and one camp foreman (Firing Team) to begin firing operations.
11. Evidence shows the Firing Team setting up a drip torch just northwest of the helipad at 1629 hours. Evidence indicates that Superintendent 16 used a Very Pistol to fire ignition projectiles across Chute A1 to attempt to begin creating black between the Camp and the fire run that was occurring at approximately 1629 hours.



*Mount Gleason Road just northwest of Camp 16's helipad. This was the approximate position that the firing team set up to begin firing operations. Notice the juxtaposition of the Gleason Canyon Saddle and Chute A1 located on the left hand side of the photograph. This was the chute that ignition projectiles were fired across to begin building black on the opposite side of the canyon.*



12. A firing contingency plan for Camp 16 had been in discussion for many years. Evidence indicates that the Firing Team's plan was to fire out along Mount Gleason Road and return to the crews that were sheltered within the Camp compound. The intent was to build black (available fuels consumed by fire in advance of the main fire front) downhill with a backing fire along with some interior firing to provide as much buffer as possible for the main fire to burn around the Camp.
13. At approximately 1630 hours, Camp 16 began experiencing an ember shower due to the unstable air and tremendous energy release that lifted massive amounts of ignited fire brands into the atmosphere. Evidence indicates that at approximately 1631 hours a spot fire was observed north and east of Camp 16. These fire brands quickly ignited other spot fires in and around the forested area on the north and east sides of the Camp. The low lying ladder fuels in the conifer trees on the northeast side of Camp 16's compound allowed the surface fire to transition easily into the crowns. The spot fires in these forested areas subsequently resulted in area ignition on the northeast side of Camp 16.



*Example of one of the many spot fires that were occurring shortly after 1631 hours in the forested area north and east of Camp 16.*

14. Evidence indicates that the Firing Team was still located northwest of the helipad at approximately 1631 hours which is noted as Point Y on the Fire Behavior Aerial Photograph. The location that Superintendent 16's vehicle went over the berm on the Mount Gleason Road and down into the canyon is noted as Point Z on the Fire Behavior Aerial Photograph.

15. The time to walk from Point Y to Point Z was measured on October 5<sup>th</sup>, 2009 by Fire Behavior Analysts Bill Baxter and Drew Smith was determined to be nine (9) minutes at a steady pace without stopping. The last radio transmission from Superintendent 16 occurred at 1643 hours. The time differential between the location where they began firing operations and their last transmission was twelve (12) minutes.
16. Aerial photography indicates chaparral brush growing along Mount Gleason Road for approximately 500 feet south of the intersection of the helipad connection road. The next segment of road the Firing Team would encounter would have been previously treated with brush disposal projects. This past fuels work had moved the line of brush approximately 100 feet downhill from the edge of the Mount Gleason Road. Fire behavior analysis indicates that the most important topographic “bowl” to create defensible black on the afternoon of August 30<sup>th</sup> would have been the one containing chutes B1, B2, and B3 due to its juxtaposition of being located directly below most of the Camp’s infrastructure.
17. The rate of production with a drip torch is normally estimated to be 100 feet per minute under good conditions. These were not good conditions because the Firing Team was attempting to ignite chaparral from the upslope position on the mid slope Mount Gleason Road to create a backing fire. Chaparral does not normally have much fine fuel on the ground in which to begin ignition using a drip torch. Any heat created by the ignited brush branches is normally lost to the atmosphere over the road instead of being transferred to other brush material as found when firing from the base of a slope or bring fire downhill along a fireline. A time estimate to fire out the first continuous 500 feet of chaparral under conditions found on the afternoon of August 30<sup>th</sup> in a prescribed fire project setting would likely range between 7 to 9 minutes (This time estimate does not factor in concerns of fire jumping the mid-slope road, and only focuses on the ignition of the continuous line of chaparral fuel to create a backing fire).
18. A backing fire at 200 feet per hour, downhill, would have traveled approximately thirty-three (33) feet ideally in ten minutes. This situation would mean that the flaming front (firing operation) would stay relatively close to the Mount Gleason Road. Once ignited, the brush would produce flame lengths 8 to 12 feet in height, and the upslope winds created by fire deep in the canyon bottom would easily cause these flames to block the road with tremendous heat in approximately ten minutes time. This situation would likely result in only one escape route option, which would be for the Firing Team to continue traveling south on the Mount Gleason Road.
19. The ability to leave the Mount Gleason Road and run upslope as a possible escape route towards Camp 16 was not possible due to the steepness of the slope. The slope above the road at the Chute B2’s location was measured with a clinometer to be 90%. A chain link fence along the Camp boundary also provided an additional barrier to reaching the structures for safety.



20. A burning condition can be created where the main fire will create an in draft that could help pull the backing fire downhill thus increasing the downhill rate of spread. This was not the case at Camp 16 due to the unstable air mass, extremely steep slopes and the tremendous energy release which was resulting in the over powering free convection winds pushing upslope.
21. Fire modeling with BEHAVE PLUS projects the elapsed time for a fire making a slope reversal at the bottom of the North Fork of Mill Creek Canyon and reaching the Mount Gleason Road for Chutes B1, B2, B3, C1 and D1 would range between nine (9) and twelve (12) minutes (assuming a maximum upslope wind alignment). Spot fires located further up from the canyon bottom could shorten this time estimate. Modeling efforts project that fire began making runs up the eastern side of the North Fork of Mill Creek Canyon somewhere between 1630 and 1635 hours. Evidence indicates that Camp personnel were experiencing tremendous heat and could also hear the sounds of a fire run approaching the Camp from the North Fork of Mill Creek Canyon at approximately 1634 hours. These sounds and heat were likely coming from fire in Chutes B1, B2 and B3 due to their location directly below most of the Camp 16's infrastructure.
22. At some point between 1631 and 1643 hours, the Firing Team was faced with the challenge of firing out brush that paralleled the Mount Gleason Road approximately 100 feet below the road's edge. The feasibility of climbing down the slope to fire out the brush well below the road would be poor due to the heat and smoke known to exist after 1634 hours. Evidence indicates that that a Very Pistol was likely used to try to ignite chaparral down slope from the road, and the Firing Team probably had limited success at best. This tool is not very effective in firing out long stretches of fire line in a rapid manner since it only provides point ignition where individual projectiles land. It takes time to reload the pistol and multiple points of ignition within 5 to 10 feet of each other are needed in quick succession to rapidly fire out sections of fire line. In addition, the projectile in many cases bounces through the brush canopy and lands on the skeletal rocky soils below the canopy which contain very little fine dead fuels for ignition to take place. Evidence indicates that use of the Very Pistol may not have been very effective for the Firing Team on the afternoon of August 30<sup>th</sup>.
23. The Firing Team, when they were working on an inside turn of the Mount Gleason Road in the segment between Chutes B2 and B3, were not able to observe any fire activity (except possibly dense smoke) with respect to Chutes C1 and D1 due to topography blocking their view. No available evidence exists that establishes that this Firing Team was working in concert with a dedicated lookout who could communicate fire behavior in areas that the Firing Team could not see.



*This is the view from the edge of the Mount Gleason Road that the Firing Team would be working from looking south towards Chute B3, which is located just around the turn that is out of view. The photograph was taken halfway between Chutes B2 and B3. The view to the south from this observation position is clearly limited due to the topography present.*

24. At 1640 hours the flaming fire front in Chute B3 was approximately 600 feet below the Mount Gleason Road with an estimated rate of spread upslope of 300 feet per minute. Evidence and analysis indicates that the Firing Crew would likely been experiencing winds gusts of approximately 50 mph, smoke would be shading the sun and obscuring local visibility, and the “freight train” sounds of the approaching fire run would be becoming much louder.

The estimated sequence of when the main fire front crossed the Mount Gleason Road at Chutes B1, B2, B3, C1 and D1 was derived from evidence and with fire behavior modeling using BEHAVE PLUS.



***This is NOT a picture of the fire conditions during the Fire Camp 16 incident. This photograph was taken on the Station Fire (Reuter/Gene Blevins) on the same day (August 30<sup>th</sup>) in the same fuel model (Fuel Model 4) as what was found in the North Fork of Mill Creek Canyon below the Mount Gleason Road and is included in this report to show the degree of flammability for heavy chaparral under similar fuel moisture conditions.***

25. Evidence indicates that the flaming fire front burned over the Camp's dormitories at approximately 1642 hours. The topographic chute that likely impacted these dormitories was Chute B3 due to the juxtaposition of these Camp structures to the topography found in the North Fork of Mill Creek Canyon. Chutes B1 and B2 have a slightly longer distance for the fire to travel from the canyon bottom (slope reversal) up to the Mount Gleason Road than Chute B3's distance. Fire behavior projections indicate that the fire front crossed the mid slope Mount Gleason Road at these chutes thirty (30) seconds to one minute later than fire in Chute B3.
  
26. Evidence indicates that trees were seen crowning south of Camp at approximately 1644 hours, which would likely place these trees south of Camp and east of the Camp road in a known area where conifer trees could be from Camp 16. Chute C1 would most likely direct fire to this area due to the juxtaposition of this chute to the potential crowning trees observed by Camp personnel during the burn over. Needle freeze patterns support the conclusion that Chute C1 provided the most heat to these torching trees. However, the rate of spread would also likely be slowed down just slightly due to the visitor parking (lack of horizontally continuous fuels) in the fire line of travel. The distance beyond the Mount Gleason Road that the fire would have to travel to reach the likely area of crowning trees has been estimated to be 200 to 300 feet. These factors would indicate that fire crossed the mid slope Mount Gleason Road at Chute C1 at approximately 1643 hours. Chute D1 would also direct fire further south of Camp 16. This affected area would be near the location where the camp entrance road and the Mount Gleason Road converge in the saddle south of Camp 16 which is in close proximity to the high tension power transmission lines.

27. Chute C1 is not as topographically evident as other chutes and bowls in the area since it is a minor bowl or chute on the landscape. This topographic feature could easily be overlooked as an influencing fire behavior feature to be concerned about. However, fire would be funneled and channeled up this chute similar to the influencing effects of Chutes B1, B2, B3 and D1. The following additional fire behavior factors were assessed with regards to the projected time that the flaming front crossed the Mount Gleason Road at the top of Chutes C1 and D1.

The timing sequence between Chutes C1 and D1 are assumed to be linked since Chute C1 has the same root origin at the bottom of Mill Creek Canyon for fire initiation as Chute D1.

The North Fork of Mill Creek Canyon has a 2,000 foot segment that is in perfect alignment with prevailing southerly winds just prior to entering the mouth of the major bowl feeding both Chutes C1 and D1.

There is a significant knob/hill at the bottom of the North Fork of Mill Creek drainage bottom that would deflect significant amount of air flow up into the bowl feeding both Chutes C1 and D1.

Chute C1 is in much more alignment with the approach from the North Fork of Mill Creek Canyon bottom than Chute D1, thus the wind speeds feeding the initial stages of the fire run (before the development of free convection/blow up stage) would be stronger in Chute C1 than D1. This factor leads to the conclusion that fire spread was further up the slope in Chute C1 than fire in Chute D1 during the first few minutes of this fire run.

The slopes are not as steep in Chute D1 (50 to 65%) as they are in Chute C1 (70%), and thus convective energy transfer was not as efficient which would result in a slightly reduced ROS.

These factors in combination indicate through fire behavior analysis that the fire crossed Mount Gleason Road at Chute C1 approximately 30 seconds to one minute before it crossed Chute D1 (See aerial photo). Further evidence provides additional support to this conclusion.

28. The entire east slope of the North Fork of Mill Creek Canyon below Camp 16 was experiencing free convection/blow up conditions nearly simultaneously across the entire west facing aspect due to a slope reversal of the fire front transitioning across the bottom of the canyon. The Firing Team did not have sufficient reaction time to reach safety due to the extreme fire behavior conditions developing in all affected areas of concern below their only possible escape route. Also, there was not a dedicated lookout available to support their firing operation to insure that the Firing Team's escape route was not compromised. The fire crossing the Mount Gleason Road at Chutes C1 and D1 was estimated to be approximately one minute after the fire crossed the mid slope Mount Gleason Road at Chute B3.



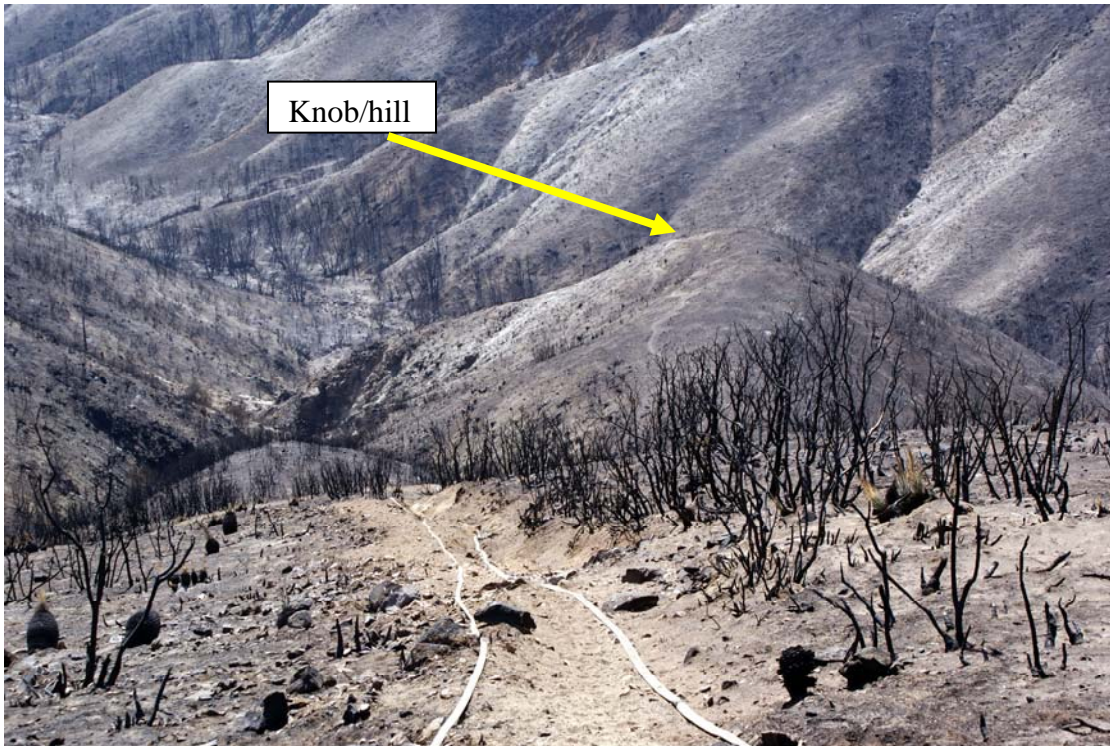
29. The last radio transmission from Superintendent 16 was broken off mid word at 1643 hours. The top of Chute C1 is the last chute the Firing Team would have passed just prior to going off the road into the North Fork of Mill Creek Canyon. This chute is in very close proximity (50 to 150 feet) to the location where Superintendent 16's truck left the road surface plunging into the North Fork of Mill Creek Canyon.
30. North Fork of Mill Creek Canyon. This flaming front and tremendous ember shower resulted in area ignition of most of the compound's buildings within the first minute of the burn over passage. Flame lengths in the surrounding conifer trees were reported to be between 100 to 200 feet tall. Heat from the structure fires added to the significant wildland fire heat already blowing eastward along the eastern edge of the Camp (as noted by numerous examples of needle freeze).

With superheated gases and smoke blasting Camp 16, personnel made planned refuge in the dining hall until it was untenable. With the dining hall roof and attic on fire, they moved into the buses under a massive ember wash. With better protection and mobility, they drove to the north parking area and took advantage of cooler air and less smoke. These actions created a favorable outcome for those involved in the Camp 16 burn-over.



Chute C1

*This was taken from the Mount Gleason Road looking north. Chute C1 is located just above the culvert, and is not an obvious topographic fire behavior feature.*

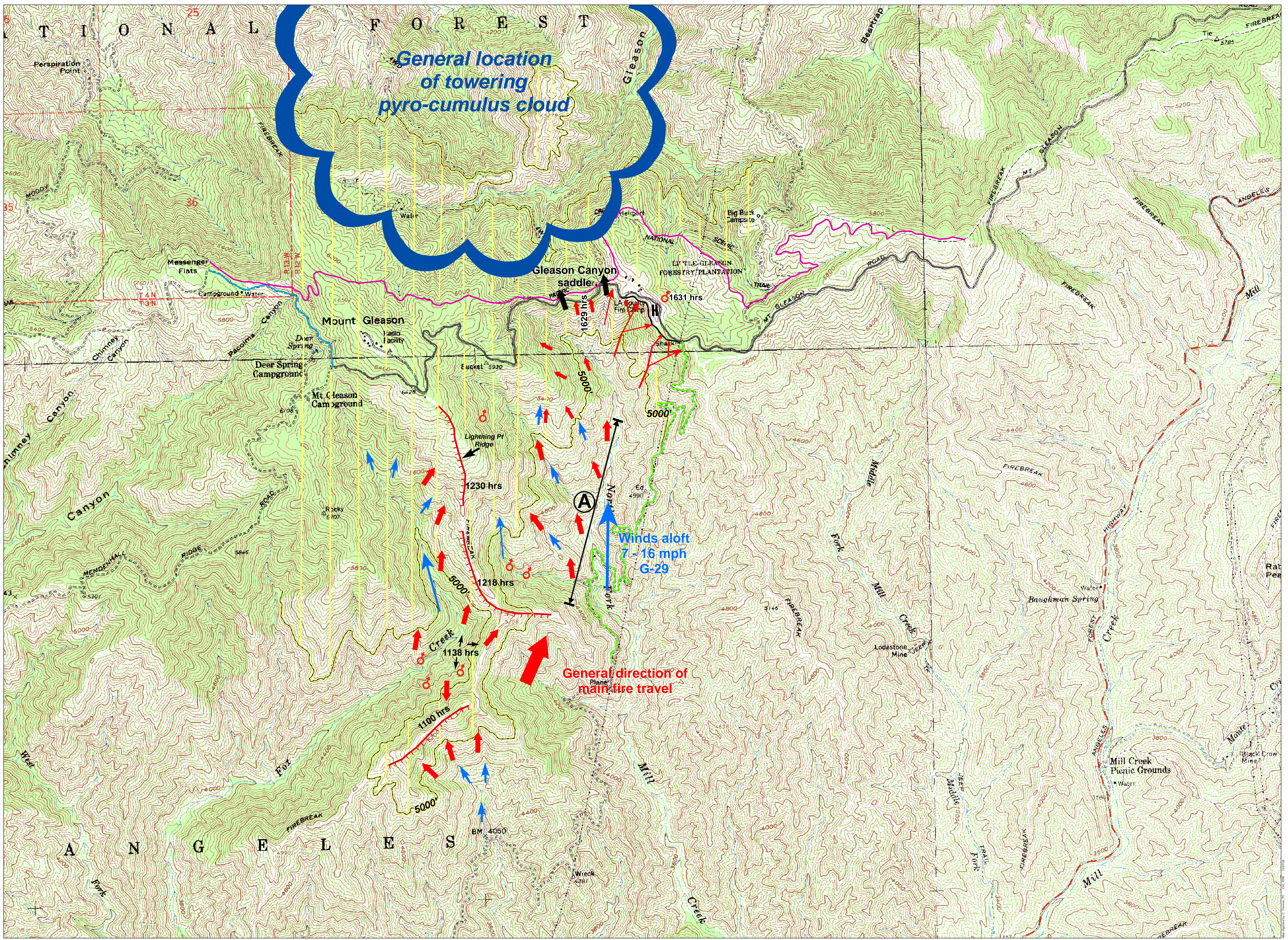


*Looking down into the Upper Fork of Mill Creek Canyon from the Mount Gleason Road between Chute C1 (located out of view to the right) and where Superintendent 16's truck left the road (located out of view to the left). The knob/hill that deflected wind up Chutes C1 and D1 is the major hill located in the middle of the picture. The up-canyon winds flowed up towards the viewer through the notch on the left hand side of this knob/hill.*

### ***Agency personnel consulted for this report:***

Matthew Mehle, Incident Meteorologist - National Weather Service,  
 Shelly Crook, Fire Behavior Analyst - USDA Forest Service,  
 Drew Smith, Fire Behavior Analyst - Los Angeles County Fire Department  
 Tim Sexton, Fire Behavior Analyst – USDA Forest Service





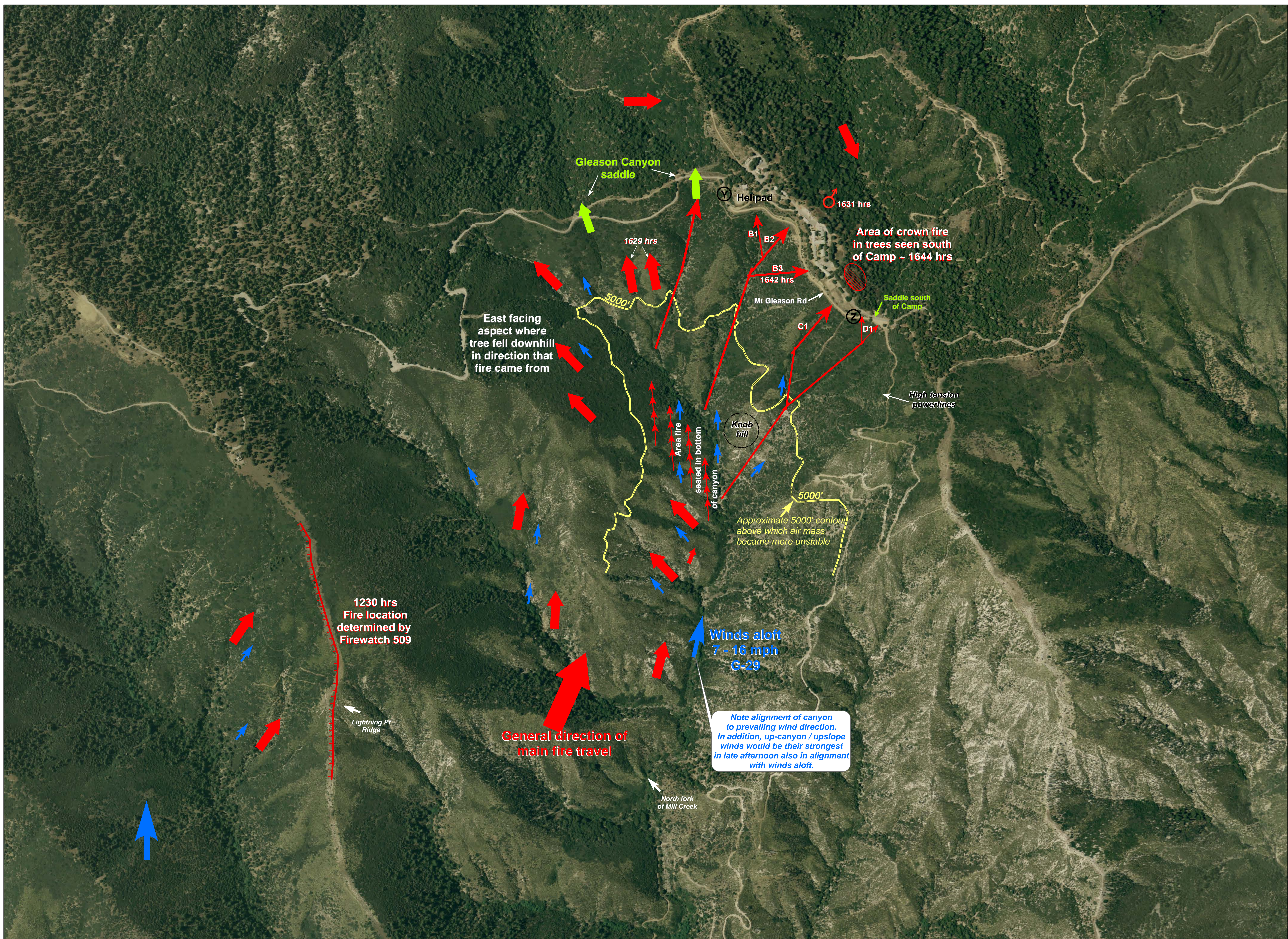
This map depicts fire behavior for the  
Station Fire on the afternoon of August 30, 2009  
Information compiled by William Baxter - FBAN  
Produced 10/22/09

## Fire Behavior Map Camp 16 ~ LA County

- ♂ Spot fire
- Fire direction of travel
- Wind direction of travel
- Contour
- Known location of flaming front
- Area above 5000' elevation with air mass that is more unstable







Map: Original by J.C. Weaver, 10/22/09



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# CALIFORNIA HIGHWAY PATROL

## MULTIDISCIPLINARY ACCIDENT INVESTIGATION TEAM



SF-28-09

JOINT INVESTIGATION  
WITH  
CAL FIRE AND THE LOS ANGELES COUNTY FIRE DEPARTMENT  
OF  
THE LOS ANGELES COUNTY FIRE CAMP 16  
FATAL MOTOR VEHICLE COLLISION

AUGUST 30, 2009

## **Collision Report**

An investigation completed by the California Highway Patrol, Southern Division Multidisciplinary Accident Investigation Team (MAIT) resulted in the following information being provided.

This collision occurred on Mount Gleason Road within the Angeles National Forest. The Angeles National Forest is an area of concurrent jurisdiction between the United States Forest Service and the California Highway Patrol (CHP). The CHP conducts traffic enforcement and investigates traffic collisions both on- and off-highway.

The CHP's Antelope Valley Area initially responded uniformed supervisory and field personnel to the scene and assumed jurisdictional responsibility for the investigation of the single vehicle, rollover collision. Due to the magnitude of the incident and the fatal injuries sustained by two Los Angeles County Fire Department personnel, the Antelope Valley Area requested Southern Division MAIT respond to conduct the investigation. MAIT consists of investigators with specialized skills and training in accident reconstruction, traffic engineering, and automotive engineering. The focus of the MAIT investigation was to analyze all human, environmental and vehicle factors involved in the collision event, determining the underlying collision and injury causation.

The following were the key findings of the investigation:

1. The Station Fire was determined to be the cause of this traffic collision. The fast approaching fire forced Superintendent Hall to make the decision to drive through the fire as it was cresting the hillside near the roadway in an attempt to outrun the flame front and proceed to a position of relative safety. There were no other avenues of escape.
2. There were no violations of law committed during this collision sequence.
3. The Ford F-350 was traveling between approximately 5 to 15 miles per hour when it deposited tire track marks and the Ford emblem from the grille on the dirt berm (as identified by witnesses) prior to descending down the hillside, striking a rock with its front left bumper.
4. The Ford F-350 had right steering input prior to the initial descent down the hillside to approximate the path of travel taken during the descent and the impact with the rock to the front left bumper.
5. The Ford F-350 remained upright on its wheels until its impact with a rock outcropping further down the hillside, which caused it to overturn onto its roof.
6. Foreman Quinones was within the passenger compartment of the Ford F-350 at the time of the collision, but was ejected when the vehicle struck the rock outcropping and overturned.
7. It is unlikely that Superintendent Hall, if conscious, would have made the right steering input needed to approximate the path of travel taken by the Ford F-350.
8. There were no mechanical factors which contributed to the cause of the collision.

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## ***Training Review Summary***

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A review of available training records was completed. Training records stored at Los Angeles County Camp 16 were destroyed by the fire..

**Superintendent Tedmund Hall** began employment as a firefighter in September of 1983. He promoted to Fire Fighter Specialist on November 1<sup>st</sup> of 1988 and transferred into the Los Angeles County Camp System on April 1<sup>st</sup> of 1996. He performed in capacity for Crew Forman in both Camp 11 and Camp 2 until July 1<sup>st</sup> of 1998. While working in Camp 11 he completed his Fire Crew Supervisor Task Book on August 24<sup>th</sup>, 1997. Ted promoted to Fire Captain on January 1<sup>st</sup> 2001 and was assigned to Camp 16 as Superintendent on May 1<sup>st</sup> 2007. His final trainee assignment as a Division Group Supervisor (T) was signed on May 14<sup>th</sup> of 2009 at the Jesusita Fire. The following completed course certificates related to firefighting are from his training file:

1. S-290 Intermediate Wildland Fire Behavior
2. S-334 Strike Team Leader- Engines
3. S-339 All Risk Division Group Supervisor
4. I-300 Intermediate Incident Command System (ICS)

Captain Hall possessed a valid Class “B” Commercial Drivers License with passenger endorsement and a current medical certification.

The mandatory training elements for a Superintendent for LACoFD which were absent include:

1. S-215 Fire Operations in the Wildland/Urban Interface
2. S-234 Ignition Operations
3. S-390 Intro to Wildland Fire Behavior Calculations

**Fire Crew Foreman Arnaldo Quinones** began employment as a firefighter in November, 2001 and promoted to Fire Fighter Specialist on December 15<sup>th</sup>, 2005. He completed his Fire Crew Supervisor Task Book, was removed from “Limited” status and was deemed fully qualified as a Crew Supervisor in August of 2008. The following completed course certificates related to firefighting are from his training file:

1. I-200 Basic Incident Command System (ICS)
2. L-280/S281 Followship to Leadership
3. S-234 Ignition Operations
4. S-270 Basic Air Operation
5. S-290 Intermediate Wildland Fire Behavior

There were no mandatory training elements absent for a Crew Foreman.

**Fire Crew Foreman Witness 20** began employment as a firefighter in March of 1999 and promoted to Fire Fighter Specialist on April 15<sup>th</sup>, 2006. He initiated his Fire Crew Supervisor Task Book and is currently on “Limited” status with 10% of his Task Book completed. The following completed course certificates related to firefighting are from his training file:

1. I-200          Basic ICS
2. I-300          Intermediate ICS
3. L-280/S281   Followship to Leadership
4. S-234          Firing Method and Procedures
5. S-290          Intermediate Wildland Fire Behavior
6. S-230          Crew Boss

There were no absent mandatory training elements for a Crew Foreman on limited status.

**Fire Crew Foreman Witness 21** began employment as a firefighter in July of 1999 and promoted to Fire Fighter Specialist on August 1<sup>st</sup>, 2003. He initiated his Fire Crew Supervisor Task Book and is currently on “Limited” status with 80% of his Task Book completed. The following completed course certificates related to firefighting are from his training file:

1. I-200          Basic ICS
2. I-300          Intermediate ICS
3. L-280/S281   Followship to Leadership
4. S-234          Ignition Operations
5. S-290          Intermediate Wildland Fire Behavior
6. S-230          Crew Boss

There were no absent mandatory training elements for a Crew Foreman on limited status.

**Fire Captain Witness 2** began employment as a firefighter in October of 1985 and promoted to Fire Captain on September 15<sup>th</sup>, 1999. The following completed course certificates related to firefighting are from his training file:

1. I-300          Intermediate ICS
2. I-400,          Advanced ICS
3. S-234          Ignition Operations
4. S-290          Intermediate Wildland Fire Behavior
5. S-215          Fire Operations in the Urban Interface
6. S-330          Task Force/Strike Team Leader
7. S-339          Division/Group Supervisor
8. S-404          Safety Officer

**Firefighter Witness 5** began employment as a firefighter in October of 2003. The following completed course certificates related to firefighting are from his training file:

1. I-200          Basic ICS



**Firefighter Witness 3** began employment as a firefighter in June of 2001 and promoted to Fire Fighter Specialist on January 1<sup>st</sup>, 2005. The following completed course certificates related to firefighting are from his training file:

1. IS-100        Intro to the Incident Command System
2. IS-200        ICS for Single Resources and Initial Action Incidents
3. IS-700        National Incident Management System
4. Fire Fighter 1    California State Fire Marshal Certification
5. Fire Apparatus Driver Operator 1A    California State Fire Marshal Certification
6. Fire Apparatus Driver Operator 1A    California State Fire Marshal Certification

**Explorer Witness 4** began as an explorer April 9<sup>th</sup> of 2002. His training file was limited to Ride-A-Long Evaluation Forms (Form 201) and other Misc. administrative forms.

**Fire Captain Witness 6** began employment as a firefighter in October of 1987 and promoted to Fire Captain on September 1<sup>st</sup>, 2008. The following completed course certificates related to firefighting are from his training file:

1. I-200        Basic ICS
2. I-300        Intermediate ICS
3. Fire Fighter I    California State Fire Marshal Certification

**Engineer Witness 8** began employment as a firefighter in April of 1997 and promoted to Fire Fighter Specialist on February 1<sup>st</sup>, 2008. The following completed course certificates related to firefighting are from his training file:

1. I-200        Basic ICS

**Firefighter Witness 9** began employment as a firefighter in September of 2008. The following completed course certificates related to firefighting are from his training file:

1. I-100        Introduction to ICS
2. S-130        Firefighter Training
3. S-190        Introduction to Wildland Fire Behavior
4. S-234        Ignition Operations
5. S-212        Wildfire Power Saws (cert. as a Class B Faller)

**Fire Crew Foreman Witness 22** began employment as a firefighter in January of 2001 and promoted to Fire Fighter Specialist on August 1<sup>st</sup>, 2006. He initiated his Fire Crew Supervisor Task Book and is currently on “Limited” status with 90% of his Task Book completed. The following completed course certificates related to firefighting are from his training file:

1. I-200          Basic ICS
2. L-280/S281      Followship to Leadership
3. S-234          Firing Method and Procedures
4. S-290          Intermediate Wildland Fire Behavior
5. S-230          Crew Boss

There were no absent mandatory training elements for a Crew Foreman on limited status.

**Firefighter Witness 9** began employment as a Fire Suppression Aid in November of 2004 and hired as Fire Fighter on September 4<sup>th</sup>, 2008. The following completed course certificates related to firefighting are from his training file:

1. I-100          Introduction to ICS
2. S-130          Firefighter Training
3. S-234          Ignition Operations
4. S-212          Wildfire Power Saws (cert. as a Class B Faller)
5. L-180          Human Factors on the Fireline
6. S-190          Introduction to Wildland Fire Behavior
7. Fire Control 6      Wildand Fire Fighting Essentials

**Fire Captain Witness 19** began employment as a firefighter in October 1989 and promoted to Fire Captain on November 16<sup>th</sup>, 2004. The following completed course certificates related to firefighting are from his training file:

1. FEMA          Safety Officer
2. S-215          Interface Operations (Victor Valley College)
3. S-200          Incident Commander, Initial Attack (Victor Valley College)
4. S-231          Engine Boss
5. S-244          Field Observer
6. S-290          Intermediate Wildland Fire Behavior
7. S-330          Task Force/Strike Team Leader
8. S-339          Wildland Fire Fighting Tactics
9. S-404          Safety Officer
10. S-133          Look up, Look Down, Look Around
11. I-300          Intermediate ICS
12. I-400          Advanced ICS
13. Fire Fighter 1      California State Fire Marshal Certification
14. Fire Fighter 2      California State Fire Marshal Certification
15. Fire Officer          California State Fire Marshal Certification

**Firefighter Witness 28** began employment as a firefighter in January of 2008. The following completed course certificates related to firefighting are from his training file:

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1. I-200      Basic ICS

**Battalion Chief Witness 1** began employment as a Fire Suppression Aid in March of 1988 and promoted to Battalion Chief on April 2<sup>nd</sup>, 2007. The following completed course certificates related to firefighting are from his training file:

1. I-200      Basic ICS
2. I-300      Intermediate ICS
3. I-400      Advanced ICS
4. S-200/300 Incident Commander Type 3 and 4
5. S-215      Fire Operations in the Urban Interface
6. S-290      Intermediate Wildland Fire Behavior
7. S-330      Task Force/Strike Team Leader
8. S-339      Division/Group Supervisor
9. Command 2E      California State Fire Marshal Office

## **Fire Camp 16 Inmate Training Summary**

Of the fifty-five inmates identified as being present during the defense and turnover of Los Angeles County Fire Camp 16, three had not had the 64 hour Fire Crew Firefighter Training (see attachment #1). The three not having the training were not members of a fire crew and were special skills inmates assigned to non-fire mission job duties at the camp they received a demonstration, but did not practice deploying fire shelters. The remaining fifty-two fire crew inmates instruction was delivered at Cal Fire's Sierra Training Center located in Jamestown California between February 23, 2005 and July 22, 2009.

During the interview process it was discovered additional training had been delivered to the inmates while assigned to Fire Camp 16. Inmate training records were documented and maintained at Fire Camp 16. All of the records were destroyed by the fire, so documentation to support additional training is unobtainable.

# Sierra Training Center Agenda First Five Days (Classroom Portion)

## AGENDA 10 day classroom

### Basic Fire Crew Firefighter

	Topic	Power point
Day 1		
	0900-1030 Fire Crew Orientation	Unit 1 intro
	1030-1130 Basic Concepts of Wildland Fire	S190 ep0 & ep 1
	1130-1200 Topographic Influences	S190 ep2A
	1200-1300 Lunch	
	1300-1500 Weather and Wildland Fire Behavior * show Fire Behavior video	S190 ep2B
Day 2		
	0900-1200 Weather and Wildland Fire Behavior * show weather video	S190 ep2C
	1230-1300 Lunch	
	1300-1400 Wildland Fire behavior and Safety	S190 ep 3
	1400-1500 <b>S-190 Test</b>	
Day 3		
	0900-1000 Wildland Personnel Protective Equipment	Day 3 Folder
	1000-1100 10 Standard Fire Orders	Day 3 Folder
	1100-1200 18 Situations That Shout Watch Out	Day 3 Folder
	1200-1230 Lunch	
	1230-1330 LCES	Day 3 Folder
	1330-1430 Common Denominators/Entrapment Avoidance	Day 3 Folder
	1430-1500 <b>Wildland Safety Equipment Test</b>	
Day 4		
	<b>10&amp; 18's test</b>	
	0900-1000 Fireline hazards	Day 4 Folder
	1000-1030 Bulldozer safety	Day 4 Folder
	1030-1100 Aircraft Safety	Day 4 Folder
	1100-1200 Heat related illness and hydration/first aid	
	1230-1300 Lunch	Day 4 Folder
	1300-1330 Fire Crew First Aid	Day 4 Folder
	1330-1430 <b>Falling &amp; Rolling Material test</b> *show hydration video & take quiz	Day 4 folder
Day 5		
	0900-1000 Hand tools	Day 5 Folder
	1000-1100 Fire Crew Organization	Day 5 Folder
	1100-1200 Fire Control Line	Day 5 Folder
	1200-1230 Lunch	
	1230-1300 Mop-up and Patrol	Day 5 Folder
	1300-1400 Fire Shelters	Day 5 Folder
	<b>1400-1500 Fire Shelters (Test)</b>	

**4200 Handbook hard copy has the units broken down as follows:**

**FIELD LESSONS:**

- 4202.6.1 Handline Construction Exercise
- 4203.5.1 How to Deploy a Fire Shelter-Standing Method
- 4203.5.1 Performance Exam: Deploying a Fire Shelter-Standing Method
- 4203.5.3 How to Deploy a Fire Shelter-Lying Down Method
- 4203.5.3 Performance Exam: Deploying a Fire Shelter-Lying Down Method
- 4203.5.5 How to Deploy Fire Shelters in Groups
- 4203.5.5 Performance Exam: Deploying Fire Shelters in Groups
- 4204.1.1 How to Inspect the Wildland Safety Uniform
- 4204.1.2 How to Don Personal Protective Clothing- Wildland Fire
- 4204.1.2 Performance Exam: Donning Personal Protective Clothing- Wildland Fire
- 4205.3.1 How to Use Cutting Tools
- 4205.4.1 How to Use Scraping Tools
- 4206.2.1 How to Tool-Up a Fire Crew
- 4206.2.1 Performance Exam: Tooling-Up a Fire Crew
- 4206.2.2 How to Tool-Up a Fire Crew-Academy Style
- 4206.2.2 Performance Exam: Tooling-up a Fire Crew-Academy Style (TDB)

**OPTIONAL FIELD LESSONS:**

- 4205.5.2 How to Make a Single Donut Hose Roll- One person Method
- 4205.5.2 Performance Exam: Making a Single Donut Hose Roll- One person Method
- 4205.5.4 How to Make a Single Donut Hose Roll- Two Person Method
- 4205.5.4 Performance Exam: Making a Single Donut Hose Roll- Two Person Method
- 4205.5.5 How to Make a Double Donut Hose Roll-Two Person Method
- 4205.5.5 Performance Exam: Making a Double Donut Hose Roll-Two Person Method
- 4205.5.7 How to Make an Out-Of-Service Hose Roll-One Person Method
- 4205.5.7 Performance Exam: Making an Out-Of-Service Hose Roll-One Person Method
- 4205.5.9 How to Couple Hose-Two Person Method
- 4205.5.9 Performance Exam: Coupling Hose-Two Person Method
- 4205.5.11 How to Extend Charged Hoseline
- 4205.5.11 Performance Exam: Extending Charged Hoseline
- 4205.5.13 How to Pick Up and Drain Hose- Accordion Shoulder Carry Method
- 4205.5.13 Performance Exam: Picking Up and Drain Hose- Accordion Shoulder Carry Method
- 4205.5.15 How to Pick Up and Drain Hose-Butterfly(Figure8) Method
- 4205.5.15 Performance Exam: Picking Up and Drain Hose-Butterfly(Figure8) Method
- 4205.5.17 How to Make a Progressive Hose Lay (Fire Crew)
- 4205.5.17 Performance Exam: Making a Progressive Hose Lay (Fire Crew)

**Inmates @ Camp 16 on August 30, 2009 (Including but not limited to Crews 16-1; 16-2; 16-5; 16-6**

85

CDC #	NAME	CLASS	GRAD DATE
F77826	Witness 117	4336	10/23/2008
F55488	Witness 88	4383	4/3/2009
P38633	Witness 87	4363	1/30/2009
V67480	Witness 86	4126	1/1/2006
G14169	Witness 122	4347	11/25/2008
F30265	Witness 73	4355	1/13/2009
K50199	Witness 93	3940	1/23/2005
G09751	Witness 106	4335	10/21/2008
F72347	Witness 70	4336	10/23/2008
G28220	Witness 112	4392	5/13/2009
F82008	Witness 105	4227	9/27/2007
F45043	Witness 92	4204	7/12/2007
V45307	Witness 100	4039	3/16/2006
V50737	Witness 98	4054	4/19/2006
V69714	Witness 85	4412	7/22/2009
V74192	Witness 76	4337	10/24/2008
P57230	Witness 108	4347	11/25/2008
P85296	Witness 109	4412	7/22/2009
V53238	Witness 107	4408	7/9/2009
V61895	Witness 80	4408	7/9/2009
G01336	Witness 116	4326	9/24/2008
F20406	Witness 119	not in system	
V86881	Witness 111	4408	7/9/2009
V46975	Witness 125	4189	5/14/2007
F27917	Witness 115	4264	3/11/2008
G28862	Witness 128	4383	4/3/2009
G08654	Witness 81	4364	2/3/2009
T98027	Witness 89	4282	5/7/2008
T09522	Witness 78	4398	6/1/2009
P88268	Witness 74	4345	11/17/2008
F71396	Witness 97	4362	1/27/2009
P24285	Witness 75	4002	10/25/2005
T23868	Witness 94	4088	8/3/2006
V53122	Witness 84	4378	3/19/2009
V76449	Witness 120	4036	2/20/2006
F36839	Witness 102	4281	5/1/2008
E97794	Witness 71	4375	3/12/2009
G28249	Witness 79	4366	2/5/2009
V78501	Witness 124	not in system	
G39986	Witness 118	4401	6/10/2009
T68842	Witness 95	4387	4/21/2009
G16066	Witness 83	4387	4/21/2009
K75856	Witness 77	4349	12/5/2008
T76399	Witness 127	4417	8/10/2009
G35495	Witness 82	4392	5/13/2009
F98882	Witness 104	4307	6/23/2008
T65784	Witness 114	4115	10/10/2006
H65583	Witness 72	4007	11/15/2005
P31021	Witness 101	4395	5/22/2009
F83968	Witness 96	4289	5/23/2008
V68386	Witness 123	not in system	
P00310	Witness 110	4397	6/1/2009
F70891	Witness 121	4238	10/29/2007
E82829	Witness 90	4360	1/22/2009



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## ***Safety Review Summary***

### **Summary**

The Safety function of SART was activated on Sept. 1 2009, along with the rest of the SART for Mt. Gleason Camp 16. The goal and objective was to ensure safe operation of team members in their actions and processes.

There was some Safety planning and review involved in the team's activity, but the main focus was obtaining evidence and documenting it.

Primary assigned duties were to

- initiate contact with CDCR
- coordinate the logistics of inmate interviews
- Coordinate vehicle inspections
- Inspect wildland Personal Protective Equipment (PPE's)
- Inspect fire shelters
- Coordinate safety during vehicle recovery operations.

-----

The team visited Camp 16 on Tuesday Sept. 2, to get an overview of the vehicle accident site and the burnover (Camp 16) site. Safety was assigned to retain and examine any deployed shelters and examine wildland PPE, and to work with the Mobile Equipment Specialist (Darren Hensley) to have safety inspections performed on vehicles involved in the burnover.

### **CDCR coordination**

I was tasked to determine a Liaison from California Department of Corrections and Rehabilitation (CDCR) for the team. CDCR Lieutenant Bill Mock of Fenner Canyon Camp took the assignment, coordinating contacts and the team's work within the CDCR system.

### **NWCG Notification**

I was assigned to prepare the National Wildland Coordinating Group (NWCG) form PMS 405, notification of fatality. After completion, it was forwarded to the LA County FD Safety officer for submittal to NWCG.

### **CAL OSHA**

Along with Team Leader Ellis and Assistant Team Leader Van Wormer, I met on Tuesday Sept. 2 with the CAL OSHA representative Stacey Christian. She informed us that CAL OSHA would be conducting a parallel investigation. She was advised that a copy of the SART report could be available to her, when completed, in approximately six months.

### **Vehicle (crew bus) inspections**

On Wednesday Sept. 3, I traveled to Camp 2 with Lt. Mock and FEM Hensley for PPE checks and vehicle inspections. FEM Hensley inspected and documented crew buses that had been involved in the burnover. The inspections were not required by LACoFD and

the safety inspection form (commonly used during the demobilization of resources at CAL FIRE incidents) did not use LACoFD standards. The inspections did, however, give an accurate operational status of the crew buses and documented any damage from the burnover.

### **Inmate wildland PPE**

There had been a concern as to PPE damage or loss of protective capability due to the intense ember shower that personnel had walked through during the evacuation from the kitchen to the crew buses. Lt. Mock and I inspected hard hats, shrouds, and the nomex shirts and pants of inmate firefighters who had been involved in the Camp 16 burnover. The nomex, with the exception of one set, was still serviceable. The overall damages found were pinhole burns similar to what would be seen after several winters of pile burning--several pinholes across the shoulders or back, and several in the lower leg areas. One set of nomex was retained due to extensive burns.

### **Fire shelters**

After deploying (opening) shelters in the camp mess hall, crews used them for protection from the heavy ember wash as they walked to the buses. Some shelters were then held up against the windows as protection from radiant heat. Fire shelters were found in the involved buses, mostly in the crew compartments. More were located at Camp 16--several were found on the grounds near the kitchen, and others were in the saw shop building. Condition of the shelters deployed in the burnover varied:

- Out of the plastic envelope, but still mostly folded with original creases intact (not used)
- Mostly opened, but not used
- Open and used, some abrasion on one end, apparently scuffed from abrasion on pavement
- Open and used, abrasions on one end and minimal burns from embers
- Open and used, abrasions on one end and significant ember burns

Fire shelters were also deployed in the vehicle accident area. They were used to protect from the continued up canyon convective heat and radiant ground heat during the early stages of the recovery effort.

All retained shelters were examined. Significant damage was marked and recorded. Contact was made with a member of the NWCG Fire Shelter Group, to determine whether this incident warranted their interest for additional inspection or testing of deployed shelters. It did not.

### **Recovery of accident vehicle**

On Sept. 7, the vehicle recovery began with a briefing at the Camp 16 helipad by Assistant Team Leader Van Wormer. Operational assignments, radio frequencies, and safety considerations were covered. With connections made by the heavy-lift helicopter company's rigger, the vehicle was moved to the helipad for additional inspection, then

transported by hired wrecker to the LA County Sheriff's Office storage facility. Additional PPE fragments, portable radio, and fire shelters were retained.

**Retention of evidence**

Fire shelter and PPE evidence retained was catalogued on LE-75 and transported to a secure location at LA County FD's Pacoima facility.

**Injuries from burnover**

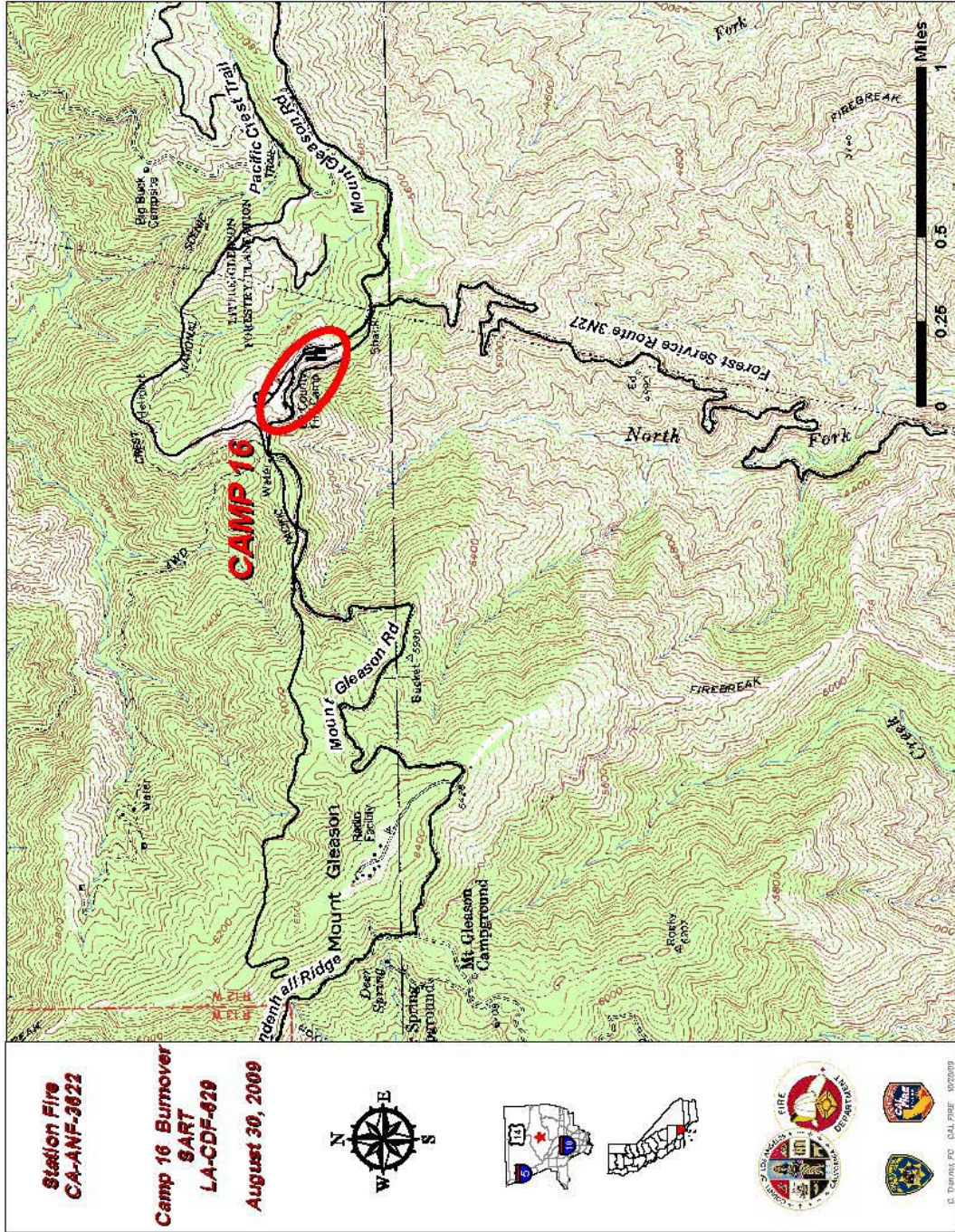
All 72 personnel involved in the Camp 16 burnover were medically checked and released. There was no additional medical treatment for CDCR staff or inmates. Information obtained (10/28/09) from LA County FD's Risk Management Division shows that 13 Department personnel were later treated, some for more than one condition.

- Smoke inhalation – 12
- Bilateral eye abrasions -- 9
- Stress – 8

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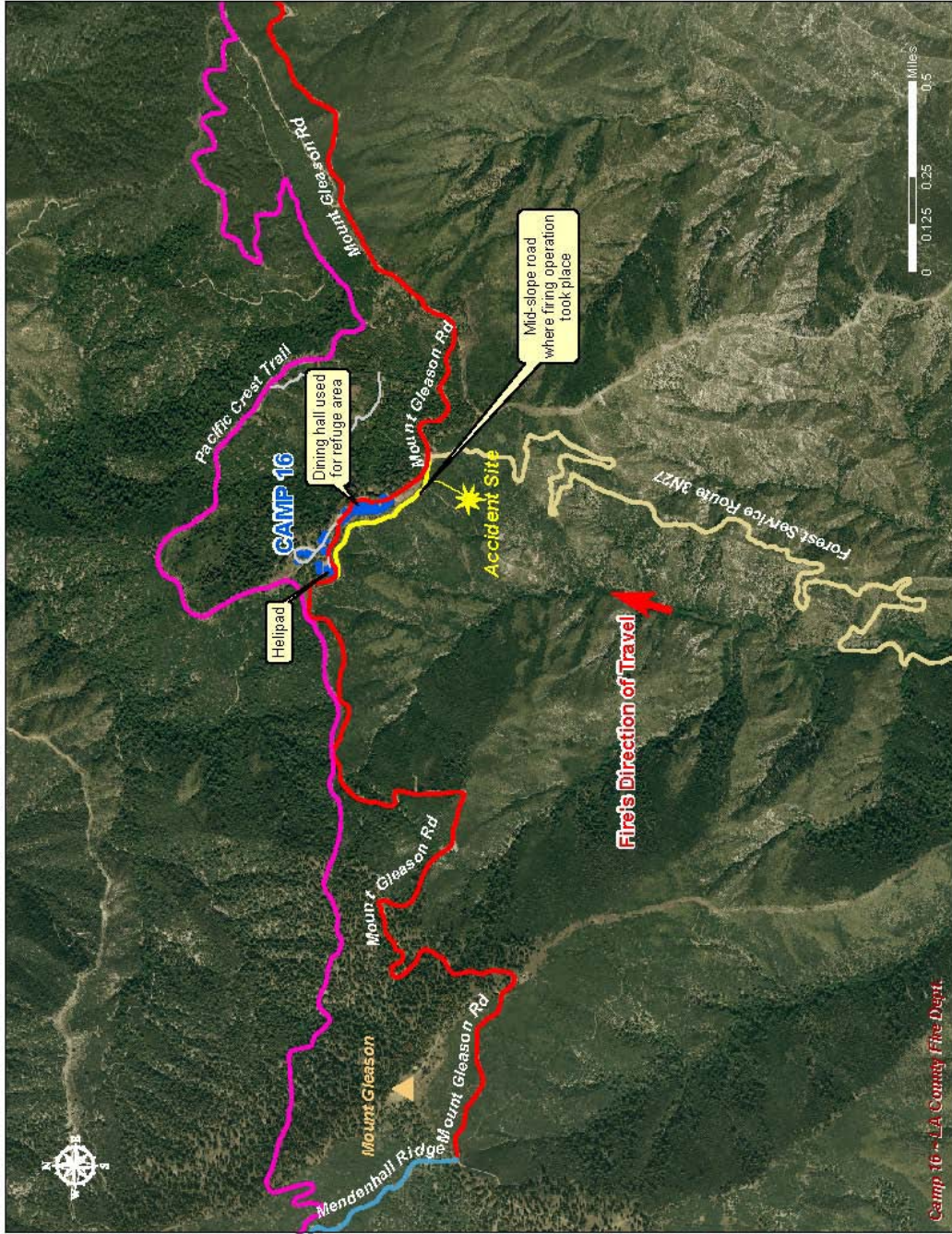
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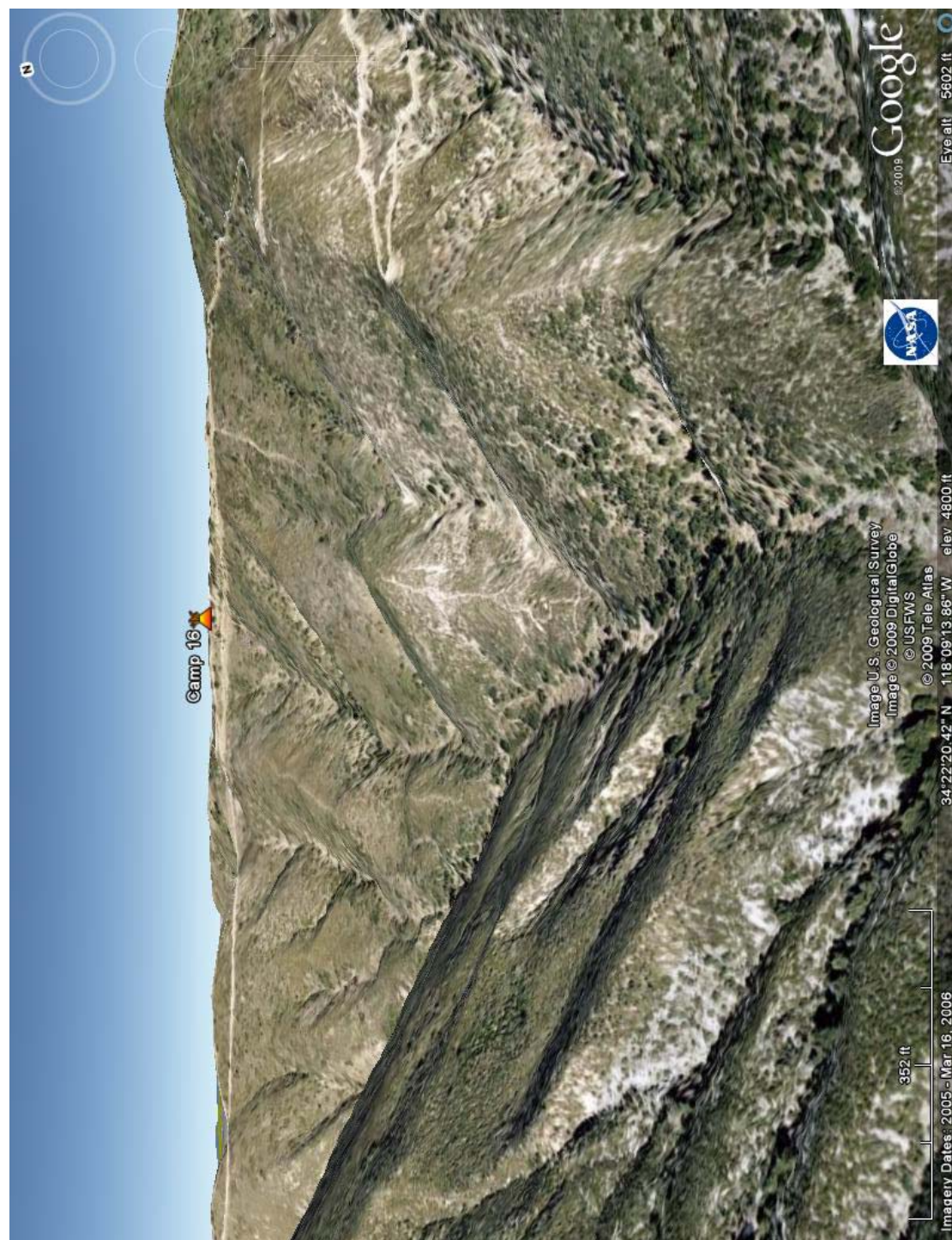
7a. Topographic map shows the location of Camp 16 and the surrounding area.





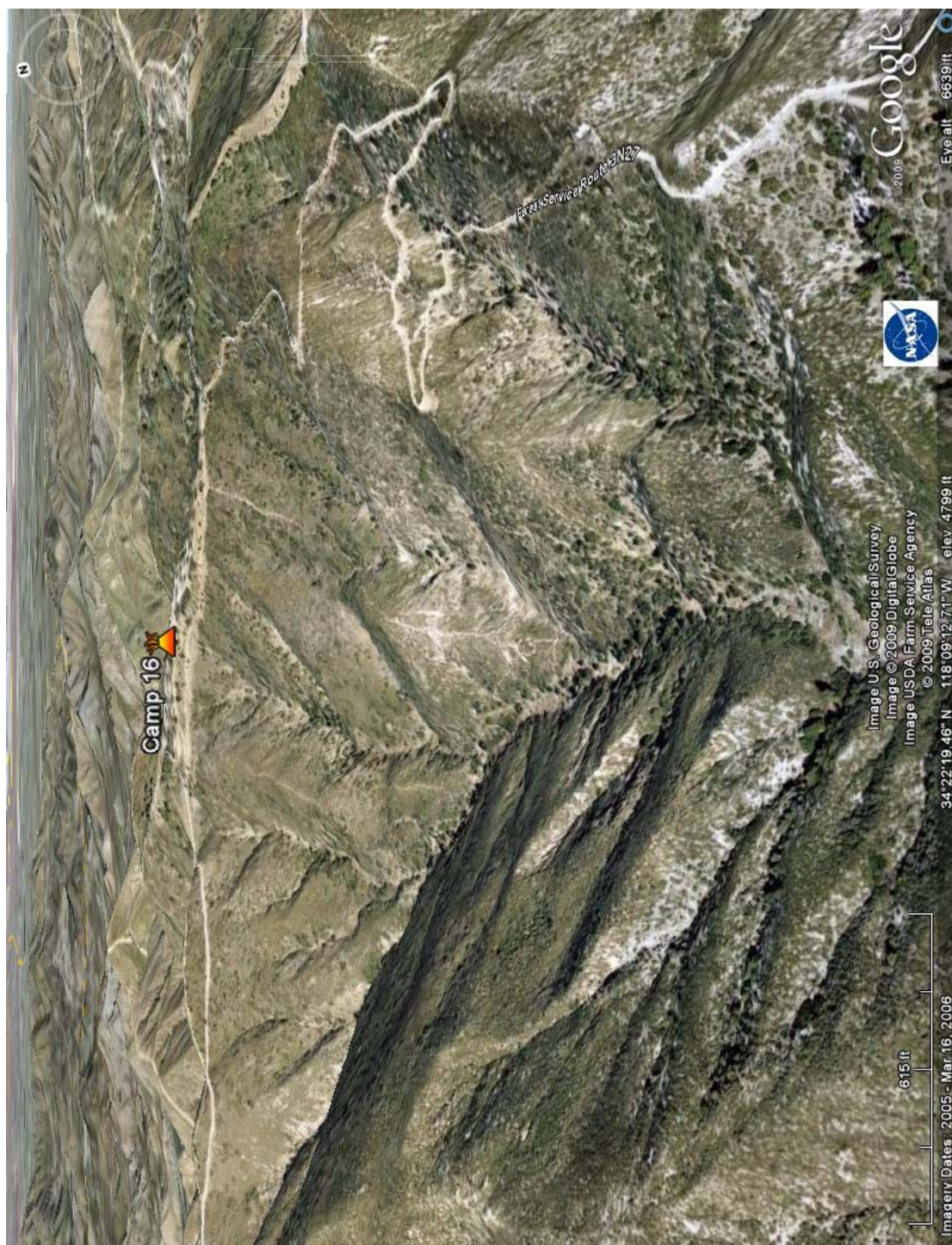
7b. Satellite image shows the general camp area, specific locations within the camp, main roads and trails, fuels and the general direction of fire travel that will help the reader better understand the incident.





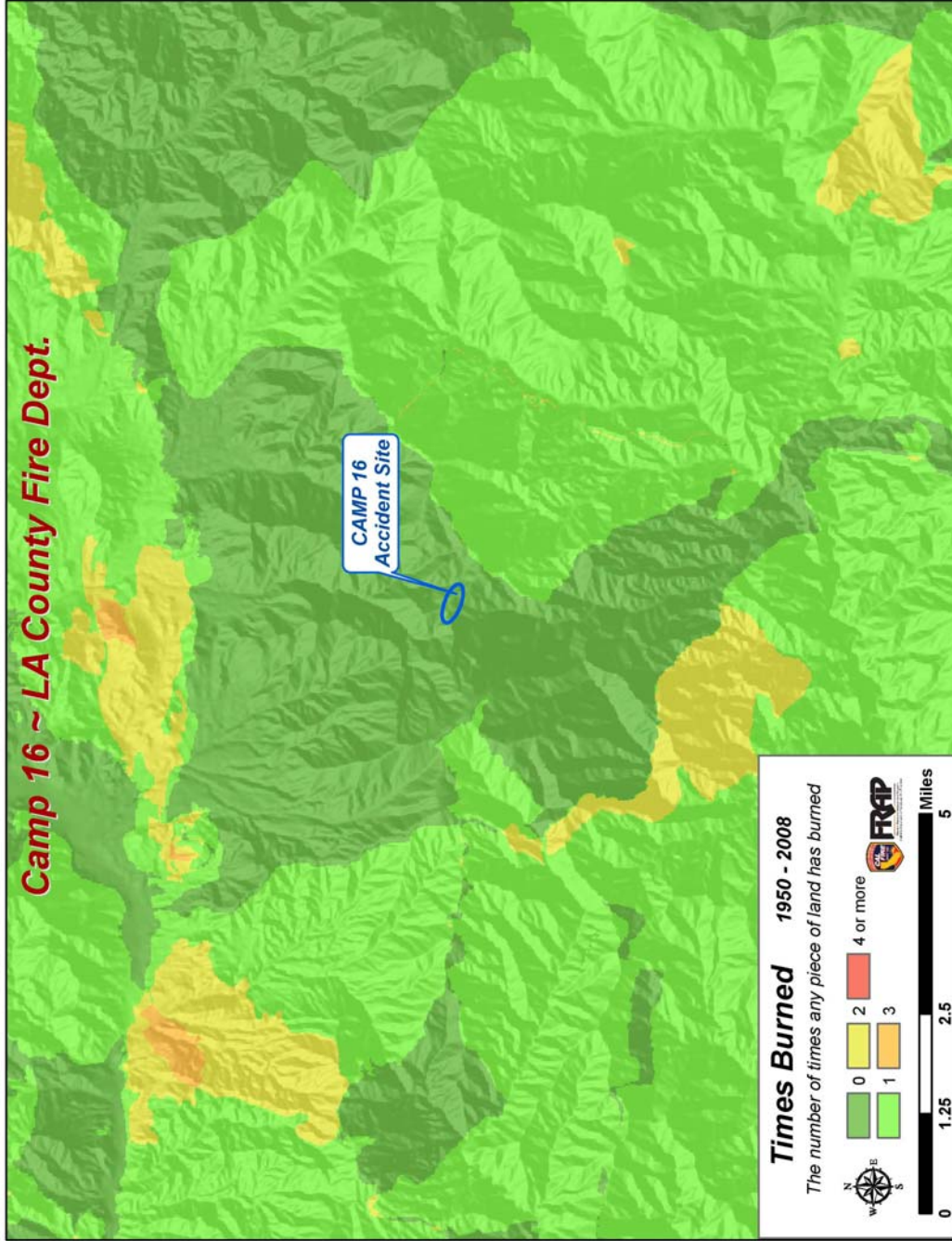
7c. Image showing the North Fork of Mill Creek south of Camp 16. Mount Gleason Road is visible to the left of the camp and Edison Road is on the right descending into the drainage.



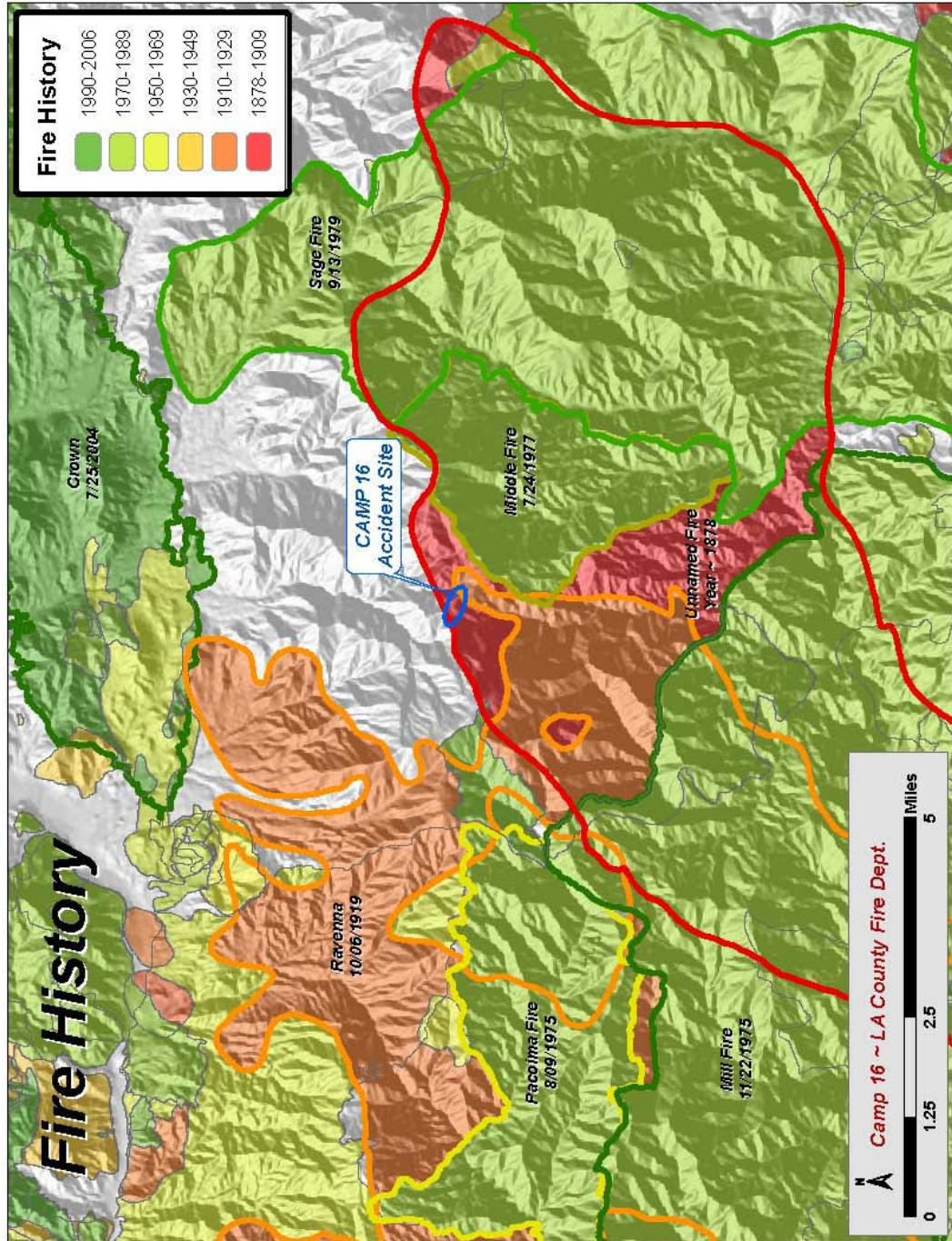


7d. Image is an elevated view of the previous image to give the viewer a better perspective of the depth and breadth of the upper end of the North Fork of Mill Creek and its relation to the camp's location.



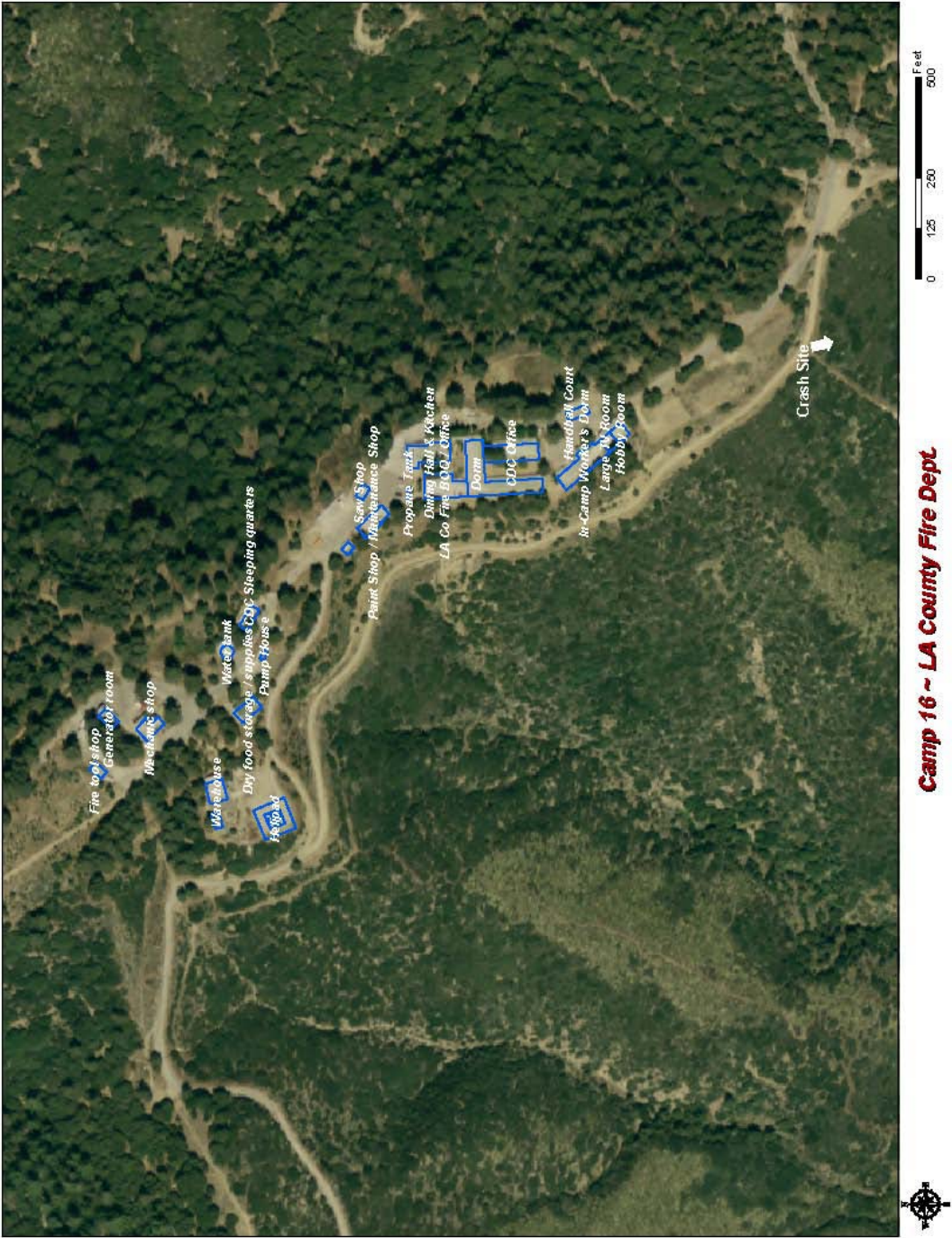


7e. Map representing the number of times any piece of land near Camp 16 has burned since 1950. Note that in the area directly around camp has no fire history since 1950.



7f. Map showing the fire history of the area. The most recent recorded fire in the area was the Ravenna Fire almost 90 years prior to the Station Fire. Prior to the Ravenna Fire was an unnamed fire in 1878.





7g. Close up image identifies structures and locations within the camp.

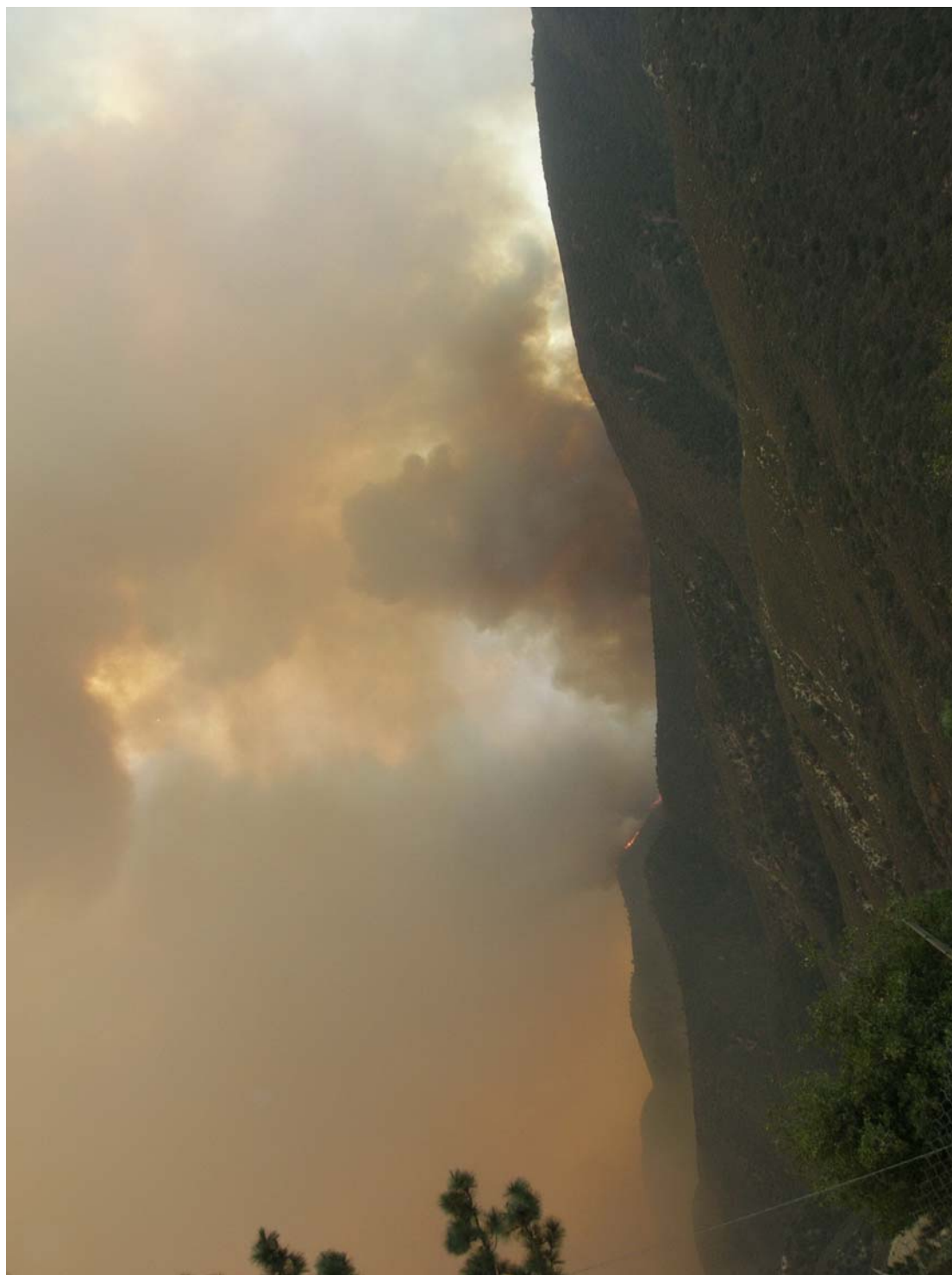




7h. Image showing the approximate location of the vehicles and their locations within the camp at the beginning of the burn-over. The crew carrying vehicles were parked in the area between the BC and E-131.

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Photograph taken by Witness 11 from Camp 16 looking to the southwest.  
Taken Sunday, August 30, 2009 at 10:52 A.M.



Photograph taken by Witness 11 of Firewatch 509 circling over Camp 16.  
Taken Sunday, August 30, 2009 at 11:47 hours.





Photograph taken by Witness 11 of E80 personnel pre-treating fuels on the south side of the in-camp inmate dorm.  
Taken Sunday, August 30, 2009 at 14:17 hours.



Photograph taken by Witness 11 of E80 in place in front of CDCR Office preparing for structure protection.  
Taken Sunday, August 30, 2009 at 14:18 hours.





Photograph taken by Witness 2 from the corner of the kitchen/dining hall looking to the northwest.  
Taken Sunday, August 30, 2009 at 16:38 hours.



Photograph taken by Witness 2 looking southwest from Camp 16.  
Taken Sunday, August 30, 2009 at 16:41 hours.





Photograph taken by Witness 8 of E80 crew making access into the in-camp inmate dorm. Corrected date and time for the photograph is 8/30/2009 at 16:46:57.



Photograph taken by Witness 8 of fire impacting the front of the camp. Corrected date and time for the photo is 8/30/2009 at 16:47:08.





Photograph taken by Witness 8 of fire front cresting over the roof of the in-camp inmate dorm. Corrected date and time is 8/30/09 at 16:47:12.



Photograph taken by Witness 8 from inside the cab of E80 of the CDC BOQ. Corrected date and time for the photograph is 8/30/09 at 17:09:30.



Photograph taken by Witness 11 from the CCV parking area looking toward the kitchen/dining hall.  
Taken Sunday, August 30, 2009 at 17:54 hours.





Photograph taken from helipad looking southeast at Camp 16 including mid-slope road.





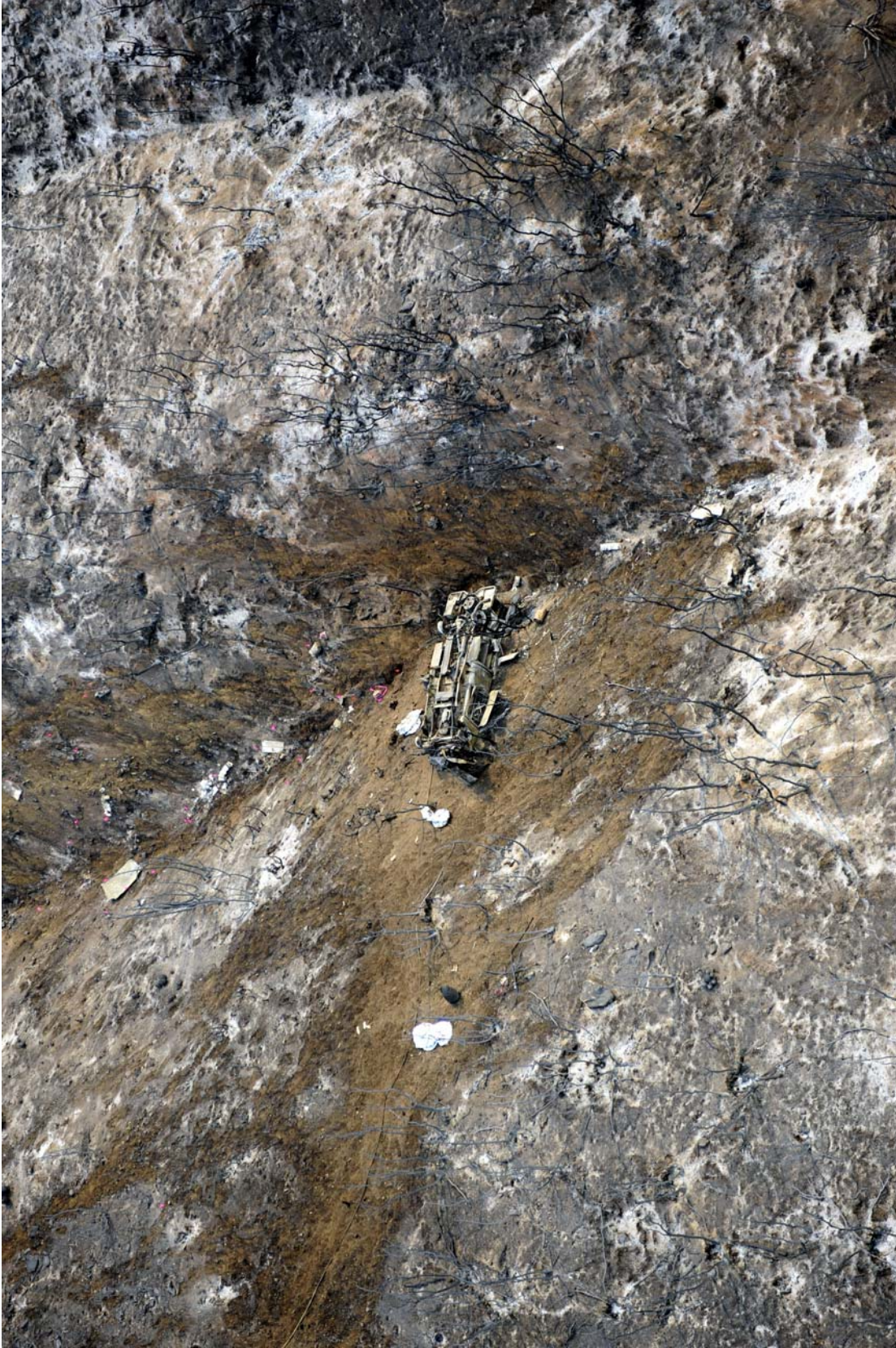
Aerial photograph of Camp 16 and accident site.





Aerial photograph of south slope incorporating camp entrance and accident site.





Aerial photograph of accident site.





Aerial photograph of southeast end of Camp 16.





Photograph of Supt 16 vehicle removed from accident site.



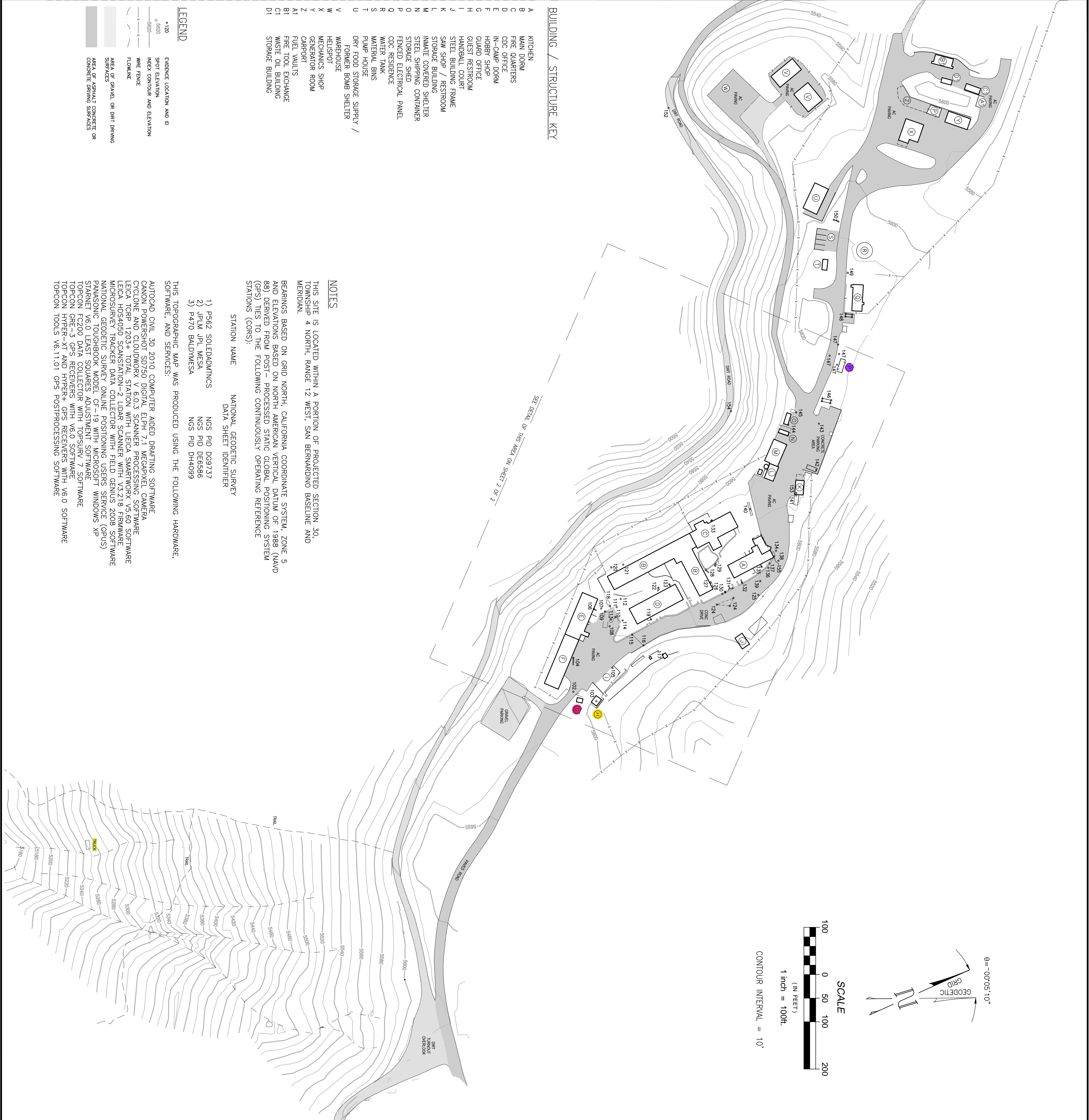


Photograph of Supt 16 vehicle removed from accident site and righted.

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PRELIMINARY

OF 2 SHEETS

1

SHEET NUMBER

PROJECT TITLE

CAMP 16

TOPOGRAPHIC SURVEY

APPROVED: 

DATE: 09/24/2009

DESIGNED BY:

DRAWN BY: JDG

REVIEWED BY: DG/DK


STATE OF CALIFORNIA

DEPARTMENT OF FORESTRY & FIRE PROTECTION

TECHNICAL SERVICES SECTION

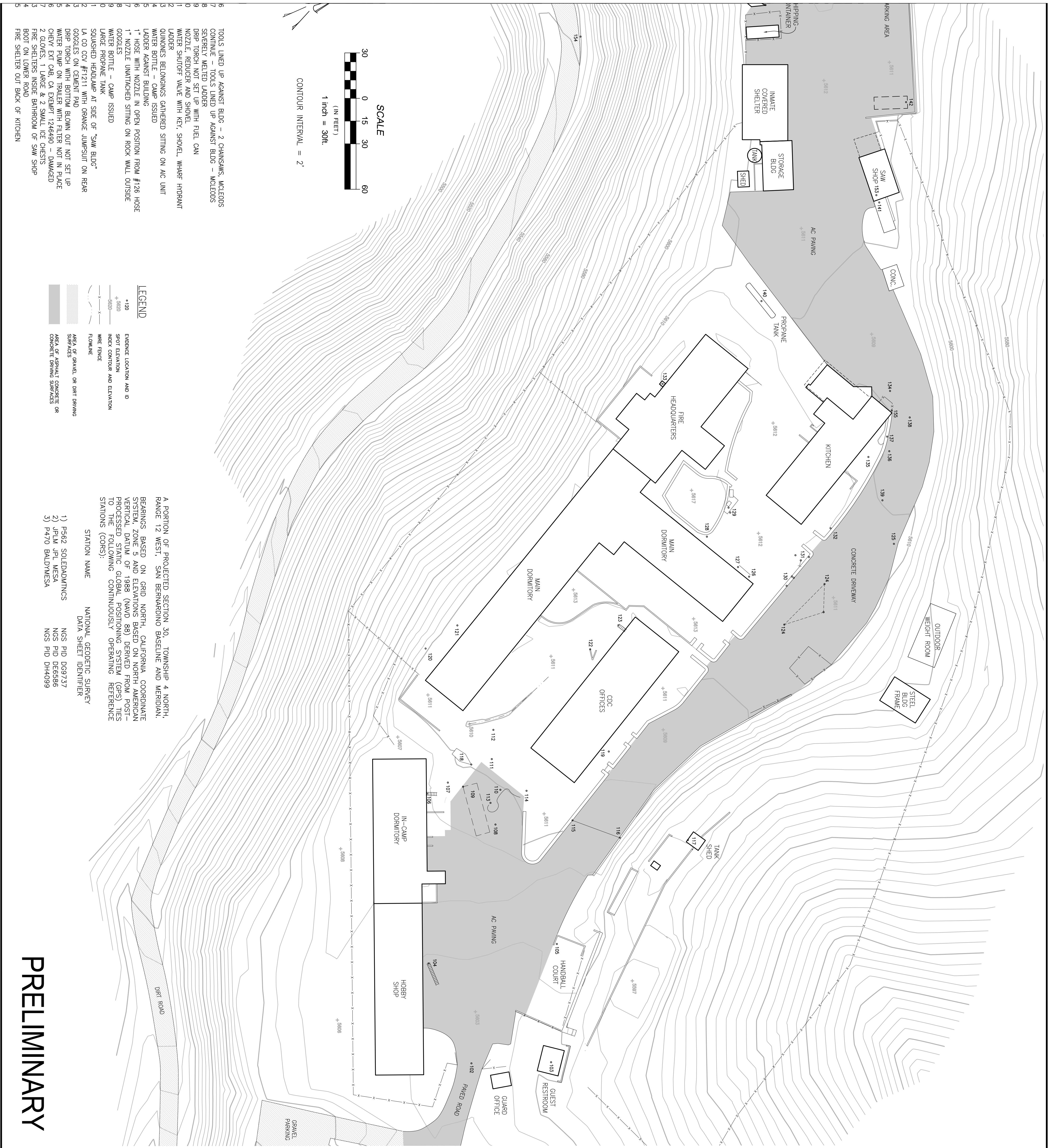
DO NOT SCALE DIMENSIONS FROM THESE PLANS. FIGURED OR WRITTEN DIMENSIONS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. IT IS INTENDED THAT THE DRAWINGS, DETAILS AND SPECIFICATIONS SHOULD AGREE. SHOULD ANY DISCREPANCY OR APPARENT ERROR OCCUR THE CONTRACTOR SHALL NOTIFY THE STATE REPRESENTATIVE AT ONCE. UPON DISCOVERY OF CONFLICTS OR ERRORS THE STATE'S REPRESENTATIVE SHALL SEEK GUIDANCE FROM THE DESIGNER OF RECORD TO RESOLVE THE PROBLEM AND WHOSE DECISION SHALL BE FINAL. APPROVAL OF THIS PLAN DOES NOT AUTHORIZE OR APPROVE ANY OMISSION OR DEVIATION FROM THE APPLICABLE REGULATIONS. FINAL APPROVAL IS SUBJECT TO FIELD INSPECTION. ONE SET OF APPROVED PLANS AND SPECIFICATIONS SHALL BE AVAILABLE ON THE PROJECT SITE AT ALL TIMES.

3	10/20/09	2nd REVISION	JDG	
2	10/08/09	1st REVISION	JDG	
1	09/24/09	INITIAL RELEASE	JDG	
No.	DATE:	DESCRIPTION	BY:	









3	10/20/09	2nd REVISION	JDG
2	10/08/09	1st REVISION	JDG
1	09/24/09	INITIAL RELEASE	JDG
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STATE OF CALIFORNIA  
DEPARTMENT OF FORESTRY &  
FIRE PROTECTION  
TECHNICAL SERVICES SECTION

DESIGNED BY:  
DRAWN BY:  
JDG  
REVIEWED BY:  
DG/DK

PROJECT TITLE	
CAMP 16	
TOPOGRAPHIC SURVEY	
APPROVED:	DATE: 09/24/2009

# PRELIMINARY

## Glossary

**Agency/Area Coordination Center:** A facility which serves as a central point for one or more agencies to use in processing information and resource requests. It may also serve as a dispatch center for one of the agencies.

**Agency Administrator:** Managing officer of an agency, division thereof, or jurisdiction having statutory responsibility for incident mitigation and management. Examples: NPS Park Superintendent, BIA Agency Superintendent, USFS Forest Supervisor, BLM District Manager, FWS Refuge Manager, State Forest Officer, Fire Chief, Police Chief.

**Air Attack:** The deployment of fixed-wing or rotary aircraft on a wildland fire, to drop retardant or extinguishing agents, shuttle and deploy crews and supplies, or perform aerial reconnaissance of the overall fire situation.

**Area ignition:** Ignition of several individual fires throughout an area, either simultaneously or in rapid succession, and so spaced that they add to and influence the main body of the fire to produce a hot, fast-spreading fire condition. Also called simultaneous ignition.

**Air Tactical Group Supervisor:** The Air Tactical Group Supervisor is responsible for the coordination of aircraft operations when fixed and/or rotary-winged aircraft are operating on an incident.

**Automatic Vehicle Locating System (AVL):** A GPS based unit that can identify the location of a vehicle.

**Barracks:** A building usually used as a crew sleeping quarters.

**Battalion Chief:** A promoted rank within the fire department that is usually above the rank of Captain. A Battalion Chief is the supervisor of several companies.

**BEHAVE Plus:** A computer program commonly used to predict wildland fire behavior.

**Blow up:** Sudden increase in fireline intensity or rate of spread of a fire sufficient to preclude direct control or to upset existing suppression plans. Often accompanied by violent convection and may have other characteristics of a fire storm.

**Blue Radio:** Ultra High Frequency (UHF), 470 MHz radio. May be used in “repeat” mode for unit to dispatch transmissions or long distance unit to unit transmissions by utilizing a repeater site or “direct” mode for unit to unit transmissions.

**Branch:** The organizational level having functional or geographical responsibility for major parts of incident operations. The branch level is organizationally between section and division/group in the operations section, and between section and unit in the logistics section. Branches are identified by roman numerals or by functional name (e.g. service, support).

**British Thermal Unit (BTU):** A measure of energy. It is approximately the amount of energy needed to heat one pound of water one degree Fahrenheit

**Burnout (or Fireout):** Setting fire inside a control line to consume fuel between the edge of the fire and the control line.

**Burnover:** A situation where personnel or equipment is caught in an advancing flame front.

**California Interagency Historical Fire Perimeter Database:** CAL FIRE/FRAP, the USDA Forest Service Region 5 Remote Sensing Lab, the Bureau of Land Management, and the National Park Service are jointly developing the comprehensive fire perimeter GIS layer for public and private lands throughout California.

**Camp: (See Fire Camp)**



**Camp Foreman:** A trained Fire Crew Supervisor with the rank of Firefighter Specialist assigned to a crew and reporting to a Superintendent.

**Camp Superintendent:** (see Superintendent)

**Chain:** Unit of measure in land survey, equal to 66 feet (20 M) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances, this unit is popular in fire management because of its convenience in calculating acreage (e.g., 10 square chains equal one acre).

**Check-in:** The process whereby resources first report to an incident. Check-in locations include incident command post (ICP), base or camps, staging areas, helibases, or direct to a tactical assignment.

**Chief:** The ICS title for individuals responsible for command of functional sections: Operations, Planning, Logistics, and Finance/Administration.

**Clinometers** An instrument that measures angles of inclination; commonly used to measure cloud ceiling heights or topographical features.

**Convection:** Generally, transport of heat and moisture by the movement of a fluid or air.

**Crew Boss:** A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare

**Dead Fuels:** Fuels with no living tissue in which moisture content is governed almost entirely by absorption or evaporation of atmospheric moisture (relative humidity and precipitation).

**Delegation of Authority:** A statement provided to the incident commander by the agency executive delegating authority and assigning responsibility. The delegation of authority can include objectives, priorities, expectations, constraints and other considerations or guidelines as needed. Many agencies require written delegation of authority to be given to incident commanders prior to their assuming command on larger incidents.

**DIN – Document Identification Number:** A document numbering system utilized to track documents for the Serious Accident Review Team.

**Direct Protection Area:** That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action. Such responsibility may develop through law, contract, or personal interest of the firefighting agent (e.g., a lumber operator). Several agencies or entities may have some basic responsibilities (e.g., private owner) without being known as the fire organization having direct protection responsibility.

**Director:** The ICS title for an individual responsible for supervision of a branch.

**Diurnal:** Daily; related to actions which are completed in the course of a calendar day, and which typically recur every calendar day (e.g., diurnal temperature rises during the day, and diurnal falls at night).

**Division:** The ICS organization level between the branch and the task force/strike team. Divisions are used to divide an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the span-of-control of the operations chief.

**Division/Group Supervisor:** The ICS position responsible for supervising equipment and personnel assigned to a division or group. Reports to a Branch Director or Operations Section Chief.

**[fire] Eddy Effect:** A circular-like flow of a fluid (such as air or water) drawing its energy from a flow of much larger scale, and brought about by pressure irregularities as in the downwind (lee) side of a solid obstacle. For example, wind conditions may be erratic and may eddy on the downwind side of large rock outcroppings, buildings, etc.

**EIN – Evidence Identification Number:** An evidence numbering system utilized to track evidence for the Serious Accident Review Team.

**EMT-I (Emergency Medical Technician-I).** An individual trained in Basic Life Support procedures and techniques and who has a valid EMT-I certificate.

**EMT-P (Emergency Medical Technician-Paramedic).** An EMT-I or EMT-II who has received additional training in Advanced Life Support procedures and techniques and who has a valid EMT-P certificate or license.

**Energy Release Component:** The computed total heat release per unit area (British thermal units per square foot) within the flaming front at the head of a moving fire.

**Engine:** (see Fire Engine)

**Entrapment:** A situation where personnel are unexpectedly caught in a fire behavior related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

**Escape Route:** A preplanned and understood route firefighters take to move to a safety zone or other low-risk area. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

**Extended Attack:** Suppression activity for a wildfire that has not been contained or controlled by initial attack or contingency forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

**Extended Attack Incident:** A wildland fire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander. Extended attack implies that the complexity level of the incident will increase beyond the capabilities of initial attack incident command.

**Extreme Fire Behavior:** "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

**FARSITE:** A computer program used to simulate wildland fire behavior and growth.

**Fire:** Rapid oxidation, usually with the evolution of heat and light; heat, fuel, oxygen and interaction of the three.

**Fire Behavior:** The manner in which a fire reacts to the influences of fuel, weather, and topography.

**Fire Behavior Prediction System:** A system that uses a set of mathematical equations to predict certain aspects of fire behavior in wildland fuels when provided with data on fuel and environmental conditions.



**Fire Camp:** A geographical site, within the general incident area, separate from the base, equipped and staffed to provide food, water, and sanitary services to incident personnel. Also a permanent facility that house personnel and equipment used in wildland fire suppression. Camp crews, crew supervisors, camp superintendents and camp foremen all may be stationed at a fire camp.

**Fire Captain:** A promoted rank within the fire department that is usually assigned as a line supervisor in charge of a unit. A Camp Superintendent is a Captain rank supervisor.

**Fire Crew:** A work crew assigned to a supervisor (usually a Camp Foreman or Camp Superintendent) that completes assignments as a unit. Usually between 8 and 15 crew members are assigned to a Fire Crew. A Fire Crew may be incarcerated or free persons.

**Firebrand:** Any source of heat, natural or human made, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or by gravity into unburned fuels.

**Firefighter Specialist:** A Firefighter Specialist has the training of a basic firefighter but has advanced through promotion to the rank of Specialist. He may be assigned to drive and operate emergency vehicles and supervise crew operations.

**Fire Engine:** A fire suppression vehicle that has a water pump and, typically, is designed to carry fire hose and a limited supply of water.

**Fire Environment:** The surrounding conditions, influences, and modifying forces of topography, fuel, and weather that determine fire behavior.

**Firefighting Forces:** Qualified firefighters, together with their equipment and material, used to suppress wildland fires.

**Fire Frequency:** A general term referring to the recurrence of fire in a given area over time.

**Fire Front:** The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

**Fire Interval:** The number of years between two successive fire events for a given area; also referred to as fire-free interval or fire-return interval.

**Firing Operation:** A general term for a firefighting tactic that uses fire to consume fuel in an effort to control fire. Usually in the form of Backfiring, Firing Out and Burning Out.

**Fire out or Firing Out:** (see Burnout)

**Fire Pack:** A one-person unit of fire tools, equipment, and supplies prepared in advance for carrying on the back.

**Fire Progression:** The progress of the fire outwards from the point of origin.

**Fire Qualifications:** Computerized interagency summary of fire suppression qualifications of listed personnel. Available information includes fire training record, fire experience record, and physical fitness testing score for each individual.

**Fire Resources:** All personnel and equipment available or potentially available for assignment to incidents.

**Firefighting Resources:** see Fire Resources

**Fire Shelter:** An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life threatening situations, as a last resort.

**Fire Shelter Deployment:** The removing of a fire shelter from its case and using it as protection against fire.

**Fire Weather:** Weather conditions which influence fire ignition, behavior, and suppression.

**Fire Weather Forecast:** A weather prediction specially prepared for use in wildland fire operations and prescribed fire.

**Fire Weather Watch:** A Fire Weather Watch is issued to advise of conditions which could result in extensive wildland fire occurrence or extreme fire behavior, which are expected to develop in the next 12 to 48 hours, but not more than 72 hours. In cases of dry lightning, a Fire Weather Watch may be issued for the next 12 hours. Also see Red Flag Warning

**Flame Height:** The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

**Flame Length:** The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity.

**Foehn Wind:** A warm, dry and strong general wind that flows down into the valleys when stable, high pressure air is forced across and then down the lee slopes of a mountain range. The descending air is warmed and dried due to adiabatic compression producing critical fire weather conditions. Locally called by various names such as Santa Ana winds, Devil winds, North winds, Mono winds, etc.

**Foreman:** (see Camp Foreman)

**Fuel:** Any combustible material, especially petroleum-based products and wildland fuels.

**Fuel Class:** Part of the National Fire Danger Rating System (NFDRS). Group of fuels possessing common characteristics. Dead fuels are grouped according to 1-, 10-, 100-, and 1000-hour time lag, and living fuels are grouped as herbaceous (annual or perennial) or woody.

**Fuel Loading:** The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area (re: tons per acre). This may be available fuel (consumable fuel) or total fuel and is usually dry weight.

**Fuel Model:** Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

**Fuel Moisture Content:** The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees F.

**Fuel Size Class:** A category used to describe the diameter of down dead woody fuels. Fuels within the same size class are assumed to have similar wetting and drying properties, and to preheat and ignite at similar rates during the combustion process.

**General Fire Weather Forecast:** A forecast, issued daily during the regular fire season to resource management agencies, that is intended for planning of daily fire management activities, including daily staffing levels, prevention programs, and initial attack on wildfires. Also called presuppression forecast.



**Geographic Area Coordination Center:** The physical location of an interagency, regional operation center for the effective coordination, mobilization and demobilization of emergency management resources. Listings of geographic coordination centers and their respective geographic coordinating areas can be found within the National Interagency Mobilization Guide, Chapter 20, Section 21.1

**Head Fire:** A fire spreading or set to spread with the wind.

**Heavy Squad:** An EMS delivery vehicle, usually with 2 Firefighter Paramedics aboard, that have additional capabilities for large multi-casualty incidents.

**Helipad:** An improved location where a helicopter can take off and land.

**Holding actions:** All actions taken to stop the spread of fire.

**Incident Action Plan (IAP):** A plan that contains objectives that reflects the incident strategy and specific control actions for each operational period.

**Incident Commander:** This ICS position is responsible for overall management of the incident and reports to the Agency Administrator for the agency having incident jurisdiction. This position may have one or more deputies assigned from the same agency or from an assisting agency(s).

**Incident Command Post:** Location at which primary command functions are executed. The ICP may be collocated with the incident base or other incident facilities.

**Incident Command System:** A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

**Incident Management Team:** The incident commander and appropriate general and command staff and support personnel assigned to manage an incident.

**Initial attack:** A planned response to a wildfire given the wildfire's potential fire behavior. The objective of initial attack is to stop the spread of the fire and put it out at least cost. An aggressive suppression action consistent with firefighter and public safety and values to be protected.

**Inversion:** Atmospheric inversion. The departure from the usual increase or decrease with altitude of the value of an atmospheric property. In fire management usage, nearly always refers to an increase in temperature with increasing height. Also, the layer through which this departure occurs (also called inversion layer). The lowest altitude at which the departure is found is called the base of the inversion.

**I-Zone:** An area that, in relation to wildland/urban fire, has a set of conditions that provides the opportunity for fire to burn from wildland vegetation to the home/structure ignition zone or vice versa.

**Jurisdiction:** The range or sphere of authority. Public agencies have jurisdiction at an incident related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., city, county, state or federal boundary lines), or functional (e.g., police department, health department, etc.).

**Limited Status:** A designation for Camp Foremen that show they have not yet completed all necessary camp instruction and have limitations on their supervision during wildland fire operations.

**Line Pack:** see Fire Pack

**Line Supervisor:** Supervisor on the line to determine that the needs of line construction are being met; normally a superintendent, crew supervisor, camp foreman, or crew STL.

**Live Fuel Moisture Content:** Ratio of the amount of water to the amount of dry plant material in living plants.

**Live Fuels:** Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

**Long Term Palmer Drought Index:** (PDI) maps show long-term (cumulative) meteorological drought and wet conditions.

**Lookout:** (1) A person designated to detect and report fires from a vantage point; (2) A location from which fires can be detected and reported; (3) A fire crew member assigned to observe the fire and warn the crew when there is danger of becoming trapped.

**LCES: Lookout(s), Communication(s), Escape Route(s), and Safety Zone(s)**

Elements of a safety system used by fire fighters to routinely assess their current situation with respect to wildland firefighting hazards.

**Lieutenant:** A promoted rank within California Department of Corrections and Rehabilitation (CDCR) above the rank of Sergeant.

**Multidisciplinary Accident Investigation Team (MAIT):** An investigative unit within the California Highway Patrol that are assigned to major or significant traffic incidents.

**Management Action Points:** Geographic points on the ground or specific points in time where an escalation or alternative of management actions is warranted. These points are defined and the management actions to be taken are clearly described in an approved Wildland Fire Implementation Plan (WFIP) or Prescribed Fire Plan. Timely implementation of the actions when the fire reaches the action point is generally critical to successful accomplishment of the objectives. Also called Trigger Points.

**Mean Sea Level (MSL):** Average height of the surface of the sea for all stages of the tide over a 19-year period. NOTE: when the abbreviation MSL is used in conjunction with a number of feet, it implies altitude above sea level (e.g., 1000 feet MSL).

**Mess Hall:** A facility use to cook and feed personnel

**Needle Freeze:** Needle freeze occurs when the fire is burning intensely, often moving in a specific direction with enough speed to “freeze” the needles in the direction the fire is burning.

**Nomex ®:** Trade name for a fire resistant synthetic material used in the manufacturing of flight suits and pants and shirts used by firefighters. Aramid is the generic name.

**Operations Section:** The section responsible for all tactical operations at the incident. Includes branches, divisions and/or groups, task forces, strike teams, single resources and staging areas.

**Operations Section Chief:** This ICS position is responsible for supervising the Operations Section. Reports to the Incident Commander and is a member of the General Staff. This position may have one or more deputies assigned.

**Patrol:** A one or two person unit used to patrol a fire area. Generally patrols carry some water and hose and are more maneuverable than engines.

**Personnel Accountability Report (PAR):** Periodic reports verifying the status of responders assigned to an incident.



**Personal Protective Equipment:** That equipment and clothing required to mitigate the risk of injury from or exposure to hazardous conditions encountered during the performance of duty. PPE includes but is not limited to: fire resistant clothing, hard hat, flight helmets, shroud, goggles, gloves, respirators, hearing protection, chainsaw chaps, and shelter.

**Pre-ignition combustion phase:** Thermal or chemical decomposition of fuel at an elevated temperature. This is the pre-combustion stage of burning during which distillation and pyrolysis predominate. Heat energy is absorbed by the fuel which, in turn, gives off water vapor and flammable tars, pitches, and gases. These ignite when mixed with oxygen to initiate the flaming combustion phase.

**Probability of Ignition:** The chance that a firebrand will cause an ignition when it lands on receptive fuels.

**Pyrolysis:** The thermal or chemical decomposition of fuel at an elevated temperature. This is the Pre-ignition combustion phase of burning during which heat energy is absorbed by the fuel which, in turn, gives off flammable tars, pitches, and gases.

**Rate of spread:** The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

**Red Flag Warning:** Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern – normally to occur within 24 hours.

**Relative Humidity:** The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

**Remote Automatic Weather Station:** A GEOS telemetric weather station that transmits hourly observations 24 times per day. These observations are automatically delivered through ASCADS to WIMS.

**Rescue Ambulance:** An EMS unit designed to transport patients. Usually staffed by two EMT's or Paramedics.

**Ridgeline:** A long, narrow range of hills.

**Run (Of a Fire):** Rapid advance of the head of a fire, characterized by a marked transition in fireline intensity and rate of spread with respect to that noted before and after the advance.

**Saddle:** A saddle shaped depression in the ridge of two hills.

**Safety Zone:** An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuelbreaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of blowup in the vicinity.

**Santa Ana Wind:** see Foehn Wind

**Sergeant:** A promoted rank within the CDCR that is above the rank of corrections officer.

**Search and Rescue Unit:** A unit within the Los Angeles County Sheriff's Department assigned to mountainous areas for the purpose of search and rescue operations.

**Self-Contained Breathing Apparatus (SCBA):** Portable air (not oxygen) tanks with regulators which allow firefighters to breathe while in toxic smoke conditions. Usually rated for 30 minutes of service. Used primarily on fires involving structures or hazardous materials.

**Shelter:** (see Fire Shelter)

**Situational awareness (SA):** The perception of what the fire is doing and what you are doing in relation to the fire and your goals. It involves an awareness of fire behavior and terrain and the ability to predict where the fire and you will be in the future. This skill depends both on individual perception and sharing it with the rest of the team. Human Factors Workshop - 1995 part 2. SA is knowing and understanding what is going on around you and predicting how things will change, or, in other words, "being coupled to the dynamics of your environment" (Moray, 2004). In the simplest form, SA describes how well someone's perception matches reality. On the fireline, especially under extreme conditions, it's critical for perceptions of the changing fire potential to reflect what's actually happening (Close, 2005). "Mindfulness" is one way of understanding situational awareness – "...coming to an understanding of yourself and your environment, maintaining an on-going scrutiny of expectations, continuous refinement and differentiation of expectations based on newer experiences, and a willingness and capacity to invent new expectations" (Weick and Sutcliffe, 2001).

**Single resource:** An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

**Size Up:** The initial assessment of an incident designed to inform incoming units of conditions at scene.

**Sounding (Upper Air Sounding):** A sampling of upper air conditions made by means of instruments and a small radio transmitter on a free balloon. Automatic radio signals originated by action of weather instruments are sent to a ground receiver. These signals are interpreted for use in analyzing and predicting upper air conditions over a wide area of the earth. Weather elements determined at a number of altitude points as the balloon rises are temperature, atmospheric moisture, pressure, wind direction and speed. Similar soundings may be made using fixed balloons or tethersondes.

**Span of Control:** The supervisory ratio of from three-to-seven individuals, with five-to-one being established as optimum.

**Spot Fire:** Fire ignited outside the perimeter of the main fire by a firebrand.

**Spotting:** Behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire.

**Spot Weather Forecast:** A special forecast issued to fit the time, topography, and weather of a specific incident. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts. Usually, on-site weather observations or a close, representative observation is required for a forecast to be issued.

**Squad:** A unit usually with two Firefighter/Paramedics assigned who are equipped to provide advance life support level care.



**Staging Area:** Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three (3) minute available basis. Staging Areas are managed by the Operations Section.

**Strike Team:** Specified combinations of the same kind and type of resources, with common communications, and a leader.

**Strike Team Leader:** The ICS position responsible for supervising a strike team. Reports to a Division/Group Supervisor or Operations Section Chief. This position may supervise a strike team of engines (STEN), crews (STCR), dozers (STDZ), or tractor/plows (STPL).

**Structural Fire Protection:** The protection of homes or other structures from wildland fire.

**Structural Triage:** Process of inspecting and classifying structures according to their defensibility/indensifiability based on their situation, their construction, and the immediately adjacent fuels.

**Superintendent (Camp Superintendent):** A trained camp crew supervisor with the rank of fire captain that has several crews under his direction.

**Supervisor:** The ICS title for individuals responsible for command of a division or group. Also used to identify the leader of a crew or unit (sometimes called Line Supervisor).

**Suppression:** All the work of extinguishing or confining a fire beginning with its discovery.

**Swamper:** A crew member assigned to assist a line supervisor, superintendent, foreman or dozer operator.

**Synoptic:** Literally, at one time. Thus, in meteorological usage, the weather conditions over a large area at a given point in time.

**Synoptic Chart:** In meteorology, any chart or map on which data and analyses are presented

**Tactical Radio:** Very High Frequency (VHF), 154 MHz radio “White Radio, or Ultra High Frequency (UHF), 470 MHz radio “Blue Radio” utilized as initial tactical radio system on incidents.

**Task Book: (Position Task Book):** A document listing the performance requirements (competencies and behaviors) for a position in a format that allows for the evaluation of individual (trainee) performance to determine if an individual is qualified in the position.

**Task Force:** Any combination of up to 5 mixed resources assembled for a particular tactical need, with common communications and a leader. A Task Force may be pre-established and sent to an incident, or formed at an incident.

**Task Force Leader (TFLD):** The ICS position responsible for supervising a task force. Reports to a Division/Group Supervisor or Operations Section Chief.

**Technical Specialists:** Personnel with special skills that can be used anywhere within the ICS organization. These personnel may perform the same duties during an incident that they perform in their everyday job.

**Triage:** Screening and classification to determine priority needs in order to ensure the efficient use of personnel, equipment and facilities.

**Trigger Points:** see Management Action Points

**Type III Fire Engine:** A wildland fire engine that has a minimum 300 gallon tank capacity, has a 120 gallons per minute pump capability, and is able to transport a minimum of 3 crew members.

**Type II helicopter specification listed in the Interagency Helicopter Operations**

**Guide – June 2009:** *Allowable Payload at 59° Fahrenheit at Sea Level: 2500;*

*Passenger Seats: 9 to 14; Retardant or Water Carrying Capability (Gallons): 300;*

*Maximum Gross Takeoff/Landing Weight (Lbs): 6,000 -12,500*

**Type III Helicopter specification listed in the Interagency Helicopter Operations**

**Guide – June 2009 :** *Allowable Payload at 59° Fahrenheit at Sea Level: 1200;*

*Passenger Seats: 4 to 8; Retardant or Water Carrying Capability (Gallons): 100;*

*Maximum Gross Takeoff/Landing Weight (Lbs): up to 6,000*

**Unified Command:** In ICS, unified command is a unified team effort which allows all agencies with jurisdictional responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating authority, responsibility, or accountability.

**Upper Air Sounding:** see **Sounding**

**Urban Search and Rescue Crew:** A pre-determined number of individuals who are supervised, organized and trained principally for a specified level of US&R operational capability. They respond without equipment and are used to relieve or increase the number of US&R personnel at the incident.

**Venturi effect:** The speedup of air through a constriction due to the pressure rise on the upwind side of the constriction and the pressure drop on the downwind side as the air diverges to leave the constriction.

**Very Pistol:** A gun used to fire flares. Used in wildland firefighting in firing operations

**Weather Information Management System (WIMS):** A centralized weather data processing system at which daily fire danger ratings are produced.

**White Radio:** Very High Frequency (VHF), 154 MHz radio utilized as initial tactical radio system on incidents.

**Wildland:** An area in which development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

**Wildland Fire Engine:** A unique vehicle that is specifically designed for the wildland environment. These fire engines are equipped with four wheel drive, rugged suspension and high wheel clearance for mountainous dirt road conditions. Fire engines are placed into category types that are used in the Incident Command System.

**Wildland Fire:** Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.

**Wildfire Suppression:** An appropriate management response to wildfire, escaped wildland fire use or prescribed fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire.

**Wildland Urban Interface (WUI):** The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

**Work/Rest Ratio:** An expression of the amount of rest that is required for each hour an individual is in work status. Current NWCG guidelines require one hour of rest for every two hours in work status.



## Acronyms

**ANF** Angeles National Forest  
**AVL** Automatic Vehicle Locating System  
**BC** Battalion Chief  
**BDF** San Bernardino National Forest  
**BI** Burn Index  
**BLM** Bureau of Land Management  
**BOQ** Bachelor Officer Quarters  
**CAL FIRE** California Department of Forestry and Fire Protection  
**CCBC** Command and Control Battalion Chief  
**CCV** Crew Carrying Vehicle  
**CDCR** California Department of Corrections and Rehabilitation  
**CFPA** Cooperative Fire Protection Agreement  
**CH/HR** Chains per hour  
**CHP** California Highway Patrol  
**CO** Corrections Officer  
**DC** Division Chief  
**DPA** Direct Fire Protection Area  
**ECC** Emergency Command Center  
**ERC** Energy Release Component  
**FBAN** Fire Behavior Analyst  
**FDFM** Dead Fuel Moisture  
**FICC** Federal Interagency Communications Center  
**FL** Flame Lengths  
**FW&S** Fish & Wildlife Services  
**GACC** Geographic Area Coordination Center  
**IAP** Incident Action Plan  
**IC** Incident Commander  
**ICP** Incident Command Post  
**ICS** Incident Command System  
**I – Zone** Interface zone same as Wildland Urban Interface  
**IMT** Incident Management Team  
**LACoFD** Los Angeles County Fire Department  
**LCES** (**Lookouts, Communications, Escape Routes, Safety zones).**  
**LVFM** Live Fuel Moisture  
**MAIT** Multidisciplinary Accident Investigation Team (California Highway Patrol)  
**MPH** Miles per Hour  
**MSL** Mean Sea Level  
**NPS** National Park Service  
**NWSFO** National Weather Service Forecast Office  
**NWS** National Weather Service  
**OIG** Office of Inspector General  
**OSHA** Federal Occupational Safety and Health Administration  
**PAR** Personnel Accountability Report  
**PDT** Pacific Daylight Time  
**PIG** Probability of Ignition

**PPE** Personal Protective Equipment  
**PSA** Predictive Service Area  
**RAWS** Remote Automatic Weather Station  
**RH** Relative Humidity  
**RFW** Red flag warning  
**ROS** Rate of Spread  
**RUC** Rapid Update Cycle  
**SART** Serious Accident Review Team  
**SCBA** Self Contained Breathing Apparatus  
**SCGCC** Southern California Geographic Coordination Center  
**SIG** Special Interest Group  
**South Ops** California Southern Operations Center  
**STL** Strike Team Leader  
**RAWS** Remote Automated Weather System  
**USAR** Urban Search and Rescue  
**USFS** United States Forest Service  
**WIMS** Weather Information Management System